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Aslib Proceedings

incorporating Aslib Information

THIRTY-SEVENTH ANNUAL CONFERENCE

Communicating Research Results

B. C. BROOKES

The Structure of National Documentation and Library Services

HERBERT COBLANS

CALCUTTA UNIVERSITY
CENTRAL LIBRARY.

ASLIB · 3 BELGRAVE SQUARE · LONDON SW1

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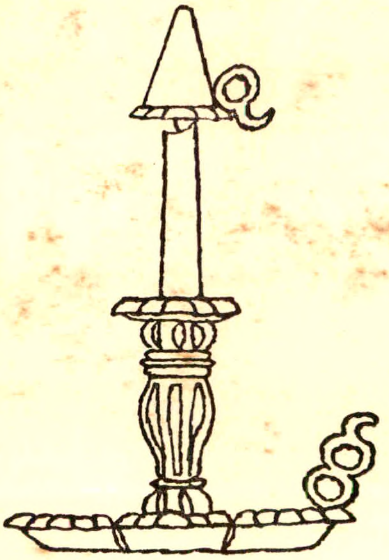

goodnight Irene

We couldn't resist this headline—even though it is, in many ways, quite unsuitable for our Mrs. Veasey. "Goodnight, Irene," implies this is the end of her

AND BLACKWELLS KNOW IT IS STILL THE BEGINNING.

Also, it sounds sleepy

AND BLACKWELLS KNOW SHE IS VERY WIDEAWAKE.

She's keeping Broad Street awake to . . . awake to all the things that librarians do and don't like. For this is her pet subject. She may be knowledgeable about catalogues, periodicals, publishers, and anything else to do with books

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CALCUTTA UNIVERSITY CENTRAL LIBRARY

ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 **January 1964** **Number 1**

ASLIB CALENDAR 1964

January

TUE.21. Evening meeting at Aslib, 5 for 5.30 p.m. 'Challenge and opportunity: Sheffield's new Postgraduate Library School', by W. L. Saunders.

TUE.21. Midlands Branch meeting at Birmingham. 'CAT libraries—problems and prospects', by E. H. C. Driver.

THUR.23 – FRI.24. Course on the trade literature collection.

WED.29. Economics Group visit to London Chamber of Commerce.

February

TUE.4 – WED.5. Course on work with patents.

WED.5. Economics Group visit to London Press Exchange.

WED.12. Economics Group visit to Westminster Bank Economic Intelligence Department.

WED.19. Economics Group visit to Aslib.

THUR.20. Evening meeting at Aslib, 5 for 5.30 p.m. Dr T. C. Barker on business records for the future. See paragraph below.

TUE.25 – FRI.28. Repeat of junior introductory course to special library and information work.

WED.26. Economics Group visit to Telex Auto Exchange.

March

MON.2 – WED.4. Repeat of course on information from the press.

WED.4. Midlands Branch annual general meeting, Birmingham. See paragraph below.

WED.4. Economics Group visit to Goldsmith Hall.

FRI.20. Scottish Branch annual general meeting and one-day conference, Glasgow.

WED.25. Evening meeting at Aslib, 5 for 5.30 p.m. K. I. Porter, Editor of BUCOP, on BUCOP.

April

WED.8. Conference on feature card indexing.

THUR.9 – SAT.11. Aeronautical Group and Chemical Group joint annual conference at Cranfield. See paragraph below.

WED.22. Evening meeting at Aslib, 5 for 5.30 p.m. 'Education for librarianship', by J. Bird, Education Officer, Aslib.

June

FRI.5 – SUN.7. Electronics Group annual conference at Ashridge College.

Aslib Evening Meeting

At the February evening meeting Dr T. C. Barker of the Department of Economic History, London School of Economics, will be talking on 'Business records for the future'. Mr Geoffrey Woledge, Librarian of the British Library of Political and Economic Science, will take the chair. Dr Barker will discuss the impossibility of preserving all business records, and the need to foresee what type of document is likely to be called for in the future, either by members of the particular business concerned or by historians who are called in to write the history of a firm. Broadly speaking, it is the policy documents that need to be kept and the day-to-day records that can often be disposed of; but there are exceptions to this general rule.

The meeting will be held on Thursday 20th February 1964 at 5.30 p.m., at 3 Belgrave Square, London SW1, and tea will be served at 5 o'clock.

Midlands Branch

The Annual General Meeting of the Branch will be held on Monday 4th March 1964 in the Birmingham College of Advanced Technology, at 6 p.m. It will be followed by a new film on the National Lending Library for Science and Technology and Mr B. C. Vickery will be the speaker. The meeting will be a joint one with the Library Association Reference, Special and Information Section Midlands Groups. Further details may be requested from the Hon. Secretary of the Branch, Mr J. H. Seals, at the College of Advanced Technology, Gosta Green, Birmingham 4.

Northern Branch

'How the industrial library deals with requests for information' was the subject of a Northern Branch evening meeting held on 22nd November at the Manchester College of Science and Technology. It took the form of a panel discussion of the techniques of answering specific inquiries received in a normal day's work in an industrial library. The Chairman was Mr Denis Grogen of the Stockport College of Further Education, and the panel consisted of Mrs Lomax of Tootal Broadhurst Lee Co. Ltd, Mr L. Taylor of Ferranti Ltd, and Mr F. Newby of Hardman & Holden Ltd.

Aeronautical Group and Chemical Group

The Joint Conference of these two Groups will be held from Thursday evening, 9th April, to Saturday teatime, 11th April 1964. This is a departure from the Aeronautical Group's usual practice of holding the conference from Friday evening to Sunday teatime. The guest speaker from the United States will be Mr Paul H. Klingbiel of the Defense Documentation Center, who will speak on the thesaurus-based retrieval systems. Mr D. V. Arnold will speak on the organization of information in ICI, and Miss D. M. Brasher will talk about the Corrosion Index at the National Chemical Laboratory. There will be a paper on bibliographic coupling and the name of the speaker will be announced later. The conference will have a lively start with a report by Mr Frank Smith on his visit to the United States. The conference programme and application form will be sent to all members of the Aeronautical and Chemical Groups.

Other members of Aslib who would like further information should write to Mr C. W. Cleverdon, College of Aeronautics, Cranfield, Buckinghamshire.

Engineering Group

The Engineering Group, in abeyance for some time, is now being re-formed and an *ad hoc* committee has been set up to organize activities. This committee is arranging a conference to be held probably in May 1964, and details will be published in a future issue of *Aslib Proceedings*. It is hoped to make the organization and activities of the Group such as to have a stronger appeal to members in the provinces. Members who are interested in joining the Group are invited to get in touch with the Liaison Officer at Aslib Headquarters.

Index to Theses

Volume XII of the *Index to Theses accepted for higher degrees in the universities of Great Britain and Ireland* has recently been published, for the academic years 1961–2.

This volume is the first to be published under new editorship since 1955. The new Editor is Mr Geoffrey M. Paterson, Deputy Librarian, Imperial College of Science and Technology, and a member of Aslib Council. The previous ten volumes of the Index were edited by Mrs Magda Whitrow, who is well known to members and who has served on the Aslib Publications and Editorial Committee (of which Mr Paterson is also a member) from its inception in 1943 to 1960 and again since 1962.

Mrs Whitrow resigned the Editorship to take up work on a fifty-year cumulative bibliography based on the critical bibliographies published annually in *Isis,* the international review devoted to the history of science and its cultural influences. Mrs Whitrow's exceptionally high standards of editing and the usefulness and thoroughness of the Index have been greatly appreciated for a long time and members will want to wish her every success in her new work.

The *Index to Theses,* volume XII, is available from Aslib, price 21*s* to members, 25*s* to non-members. It will be issued automatically to those who have placed standing orders.

DSIR–Aslib Visit to USSR

The Department of Scientific and Industrial Research is shortly to issue the report of the DSIR–Aslib delegation to Russia which took place last summer. As members will know, this was the subject of an Aslib evening meeting and a paper and discussion were published in *Aslib Proceedings* for December 1963.

The DSIR booklet will be entitled *Scientific and Technical information in the Soviet Union: report of the DSIR–Aslib delegation to Moscow and Leningrad 7th–24th June* 1963, and will be published probably in early February. Copies of the booklet may be requested from the DSIR Information Division, State House, High Holborn, London WC1.

The Use of the Chemical Literature

A short course is being organized by the Liverpool College of Technology in conjunction with Liverpool Public Library and LADSIRLAC from Wednesday

19th February to Friday 21st February 1964. The course will consist of directed library work and lectures by chemists and librarians, and is designed to show newly qualified chemists in research and industry what information is contained in the chemical literature and how to retrieve it.

Further information may be obtained from Dr C. B. Clarke, Department of Chemistry and Biology, College of Technology, Byrom Street, Liverpool 3.

Automation of Library Processes

A new type of course will be offered in the spring semester, 1964, at the Western Reserve University School of Library Science, entitled 'Automation of library processes and procedures'. This course is planned to evaluate the possible uses of data-processing equipment within the traditional library functions—acquisitions, catalogue production, circulation, and so on. Punch cards, computers, microrecords, photography, and visuals will be discussed; comparative costs and current library installations will be reviewed.

The course will be given by Miss LaVahn Overmyer, Assistant Professor of Library Science and Manager, Technical Resources, Center for Documentation and Communication Research at WRU. Details about the course may be obtained from the Center for Documentation and Communication Research, School of Library Science, Western Reserve University, Cleveland 6, Ohio, USA.

Library Periodicals Readership Survey

A survey of the readership of library periodicals by librarians—both public and special—and of the use made by them of this material is currently being undertaken by Mr David C. Fanning on behalf of CFC Research.

The survey will operate on a sample of all public and special libraries in the United Kingdom, and is expected to be completed in May 1964. It is anticipated that a report of the main findings will appear nearer the date in a library journal, and the full report and tables will be available on a subscription basis from CFC Research of 50 Ewart Grove, London N22.

Standard Guide to Technical Terminology

A new British Standard has been published, entitled *Recommendations for the selection, formation and definition of technical terms*. Much has already been done through BSI glossaries of terms to provide individual industries and technologies with their own, agreed standard language. Even so, the approach may often vary from industry to industry. Internationally, the ISO (International Organization for Standardization) is preparing recommendations on the principles to be followed by *all* industries in defining terms. The new British Standard embodies some of these ISO recommendations and should prove of great value to all who have the job of helping to define technical terms in national or company standards, in complete glossaries of terms, or in technical writing generally.

The Standard, BS 3669, was published at the end of 1963 and copies are available from the BSI Sales Branch, 2 Park Street, London W1, price 5*s* (postage will be charged extra to non-subscribers).

Denmark Library Study Tour

Mr K. C. Harrison, M.B.E., Westminster City Librarian, is to conduct a fifteen-day study tour of Danish libraries in the summer. Several days will be spent in Copenhagen and other visits will include the new building of the State University Library at Aarhus. The tour will take place from 18th July to 1st August and the cost, covering rail and boat fares and hotels, will be £65. Members who are interested should get in touch with Foyles Travel Society, 119–125 Charing Cross Road, London WC2 (telephone GERrard 6807).

Data Processing in Medicine

The 1964 Rochester Conference on Data Acquisition and Processing in Medicine and Biology will be held at the University of Rochester from 13th to 15th July 1964. The theme will be 'Medical literature and data—its acquisition, processing and retrieval'.

Original papers are being requested, to be submitted by 15th April, and will be published in the Conference Proceedings series. Anyone who is interested in submitting a paper is invited to send an abstract to Mr Kurt Enslein at 42 East Avenue, Rochester, New York, from whom further information can be obtained.

DSIR Grants in Documentation

The Department of Scientific and Industrial Research has recently made five long-term grants for documentation research projects in different fields. The following awards were announced:

1. To Mr A. C. Leyton of the Northampton College of Advanced Technology, London, 'To develop new methods of information retrieval, and to test their efficiency'. (£12,150 for four years from 1963.) The research will be directed by Mr J. E. L. Farradane, Senior Research Fellow at the College (whose appointment was announced in *Aslib Proceedings,* August 1963); in the first place, the 'relational indexing' system will be applied to a large body of scientific documents and tests to measure its efficiency will be developed.
2. To Professor J. D. Bernal of Birkbeck College, London, 'New methods of compiling and coding data in the field of chemical crystallography'. (£3,100 for three years from 1963.) Methods will be investigated with the aid of a computer.
3. To Mrs M. M. Braithwaite of the Cambridge Language Research Unit, 'Computer testing of an interlingual bracketing programme'. (£15,000 for three years from 1963.) The validity of a lattice model derived to provide a syntactical description of a language will be tested.
4. To Professor R. Quirk of University College London, 'Computer project within the Survey of English Usage'. (£8,000 for four years from 1963.) The long-term purpose of this is to produce a reliable picture of the grammar and syntax of the English language, using material collected in the Survey.
5. To Professor A. McIntosh of the University of Edinburgh, 'Mechanical analysis of language'. (£25,000 for four years from 1963.) This research is designed to produce a detailed machine description of the English language which would enable a computer to analyse English texts automatically.

ASLIB 37th ANNUAL CONFERENCE

University of St Andrews, 24th—26th September 1963

NEARLY 300 people attended the 37th Annual Conference, held at the University of St Andrews. The Conference was formally opened by the Chairman of Council, Mr L. G. Patrick, Librarian of Aluminium Laboratories Ltd, who read the following letter from the President, Lord Shackleton:

'I am sorry that it has not proved possible for me to attend the Annual Conference at St Andrews of Aslib, of which I have had the honour of becoming President, but I would like to send my best wishes for the success of the Conference.

'Having studied the agenda, I can see that you have some pretty solid work to get through, though no doubt it will be full of interest.

'The growing responsibility and importance of the work which Aslib undertakes is, of course, reflected in the support which Aslib receives from DSIR. However, we must still do much in order to get across to Government, industry and the community at large that we are not just practising an esoteric art, but are concerned in activities which are quite fundamental to progress.

'In this connection, I hope that the recent report of the President of the United States Science Advisory Committee on The Responsibilities of the Technical Community and the Government in the Transfer of Information will not go unmarked in Britain.'

With best wishes,
[signed]
SHACKLETON,
President—Aslib.

The papers presented at the first two sessions of the Conference, by Mr B. C. Brookes and Dr Herbert Coblans, appear in this issue of *Aslib Proceedings*. The succeeding papers, by Mr J. Mills, Mr C. W. Hanson, and Mr B. C. Vickery, will be published in the February issue.

COMMUNICATING RESEARCH RESULTS

B. C. BROOKES, M.A.

Senior Lecturer in Presentation of Technical Information, University College London

Chairman, Gordon H. Wright, A.L.A., F.I.R.T., County Technical Librarian of Hertfordshire

37th Annual Conference, University of St Andrews, September 1963

A DISCUSSION of the communication of research results has to begin with clarification of the terms and with a limiting of the boundaries of a subject too wide for a single talk. Though scientific knowledge acquired for its own sake is eventually applied and though communication in *pure* science also has its problems, Aslib is primarily interested in science applied to technology; and so I shall limit my discussion to problems of communication in applied science. But even the term 'applied science' embraces a wide spectrum of problem-solving activities: the problems at one extreme are to find technological applications of new scientific theories and, at the other, to find optimum solutions of technological problems for a given set of economic and practical conditions. It is convenient to retain the term 'applied science' for research work which springs from science and looks towards its application; work which springs from a technological problem and looks towards science is best called 'technological development' or simply 'development'. In most industrial laboratories both applied science and technological development are undertaken side by side, and rightly so since each stimulates the other, but the distinction between them is needed here because, as we shall see, their communication processes are different.

The linking of science and technology is, historically, a comparatively recent affair so we must not be surprised if their association is not yet a perfect union. The link was first made in the dyestuffs industry which, originating with Perkin's accidental discovery of the aniline dye mauvine in 1856, steadily discovered how to replace natural by synthetic dyestuffs. The dyestuffs industry has always been dependent on a natural unforced relationship between workers in the chemical laboratory and workers in the manufacturing plant. The other new industries arising directly from scientific discoveries—the heavy electrical industry, electronics, nuclear power, for example—have also always been scientifically based. Most other industries, however, have developed from craft traditions based on an intimate and intuitive knowledge of materials and processes; and these industries with the oldest and strongest craft traditions have been reluctant to accept the hand of science. In 1916 the Government set up DSIR to encourage the promotion of research and its application to industry: by continued exhortation and certain tax reliefs, by the setting up of fifty grant-aided research associations and its own research establishments it has helped to intensify and widen the scope of science applied to industry. The campaign continues. It has recently been estimated that the proportion of the gross national product devoted to research (including a large but declining proportion on defence research) has been growing in recent years at about 9 per cent per annum,[1] and that, at its present rate of expansion, the annual expenditure on research will reach £1,000 million in about three years.[2] But there is another side to the picture: there is no point in our tilling the ground and sowing the seed unless we also reap the harvest. There are some indications, difficult to assess exactly, that we are not reaping the harvest fully; and there are even complaints that others are stealing some of our crops. So, though the policies of *promoting* industrial research are being reasonably successful, we now have to ensure that the results of this research are fully *applied* as otherwise we are working in some degree to no purpose.

Since their first intimate relationship was established in the dyestuffs industry there has been a change in the relationship between research and its application. The first industrial laboratories adjoined the manufacturing plants they were established to serve; the scientists and the plant engineers could meet and personally discuss proposed innovations. Industrial development laboratories are still built on this pattern. But the applied science laboratories are often built away from the manufacturing plant. The first Government establishment for applied science, built after a public campaign lasting thirty years and supported by the findings of two Royal Commissions—the National Physical Laboratory—was intended to serve British industry as a whole; it obviously had to be a centralized entity and could not disperse itself to be close to all its potential clients. But the advantages arising from centralization—concentration of financial and scientific resources and avoidance of distraction from their long-term projects by the urgent immediacy of day-to-day problems—are bought at the cost of complicating and diffusing the lines of communication between the scientist and those who could apply his work. If an industry is compactly concentrated in one small locality its applied science laboratory can also be sited in that locality—the Lace Research Association is in Nottingham, the Cutlery Research Council is in Sheffield, the British Ceramics Research Association is in Stoke—but, for the most part, particular industries are widely scattered over Britain and it is impossible for all the applied science laboratories to be within walking distance of their potential clients. Thus the communication patterns between manufacture and development on the one hand, and between manufacture and applied research on the other, are different: the one is more immediate and direct and can be based on informal oral dialogue, aided by practical demonstrations; the other is remote and indirect, and it is usually based on formal impersonal documents transmitted through a number of intermediaries so that there are risks of ambiguities, vaguenesses and misunderstandings arising. As the scope of applied research intensifies and widens, so the problem of enabling applied scientists and their widely dispersed clients to communicate effectively is likely to become more acute. In fact, unless the communication problems in applied science are tackled more seriously than at present, the wisdom and economics of promoting still more applied research could be challenged by asking for evidence that the present programmes are paying off, that the results at present achieved are being effectively applied. Why throw even more results into the air—and even more public money to the winds—just to keep teams of applied scientists in monastic seclusion happy in their devotion to pure knowledge? I can imagine such questions being publicly asked.

What *are* the problems of communication in applied science? They all centre round the main problems of ensuring that published research information should reach those who can make use of it as quickly and effectively as possible. They centre round the use of the words 'information' and 'communication'. Essentially, one might say, what is wanted is 'a more effective means of communicating information' than we have at present. But my complaint is that this key phrase has not been sufficiently analysed. If we are to discuss in a constructive way any aspect of human communication, such as the communication of the results of scientific research, and how such communication might be improved, we must base our discussion on some general theory of human communication. In most discussion about communication this theory, whatever it may be, remains implicit. Since we all communicate, or attempt to, with others, and since communication between humans as distinct from that between insects or birds, is not simply a process in which a sequence of stimuli evokes automatic responses, since we feel that we have some freedom of choice in deciding what to say and how to say it, presumably we have some criteria by which we assess that one form of approach in a particular communication situation is better than another. In short, whether we are conscious of it or not, we each have a private theory of communication which we have developed for ourselves.

For everyday purposes these private implicit theories are normally adequate; most of us learn by experience the social skill of adjusting our responses appropriately to different communicative situations. However, if we are going to discuss general systems with the serious purpose of trying to improve them, we must try to make our theory of communication explicit, otherwise we are not being scientific, otherwise we are putting nothing at risk in our experiments and can learn nothing from our mistakes. We need not only private theories but a public professional theory as well.

I have been surprised in recent years to find how much an intelligent and articulate man's private theory, as inferred from his successful everyday social behaviour, can differ from his professional theory, as inferred from what he says or does about a problem in communication as a professional. The prevalent professional theory of communication put in its simplest terms is this: If someone has knowledge (or ideas or information) which he wishes to impart (or convey or transmit) to another, then he expresses (or encodes) the knowledge in the appropriate natural language, simply and clearly, and addresses it to the person he wishes to inform: communication will then take place, that is to say, the second person will interpret or decode the message and so the knowledge (or ideas or information) will be conveyed from one mind to the other. One reason why this simple theory is publicly stated only rarely is that it is assumed to be so obviously true that it is almost a truism. But it is implicit in much that is said about communication and information professionally. Those who hold such a theory can be detected in various ways: for example, they believe there is an ideal language in which anything, however complex, can be made clear to anybody, however dim; they are pedantically fussy about grammar—especially other people's—and they put the onus of the communicative effort wholly on the person who has something to say. But in a scientific study of communication the problem to be solved is not why communication sometimes fails, but why or how it happens at all.

Closely associated with the simple theory of communication there is a simple theory of knowledge or of information which is also widely held. In its starkest form the theory was propounded in the early 1920s in a philosophical treatise—Wittgenstein's *Tractatus logico-philosophicus*.[3] According to this theory, the whole of knowledge is expressible only in the form of atomic propositions—single, simple facts about objects—so that I shall call it the 'atomic theory of knowledge'. It was inspired, I think, by the success of the atomic theory of matter and the quantum (or atomic) theory of energy in physics. Though Wittgenstein later repudiated the theory, it was adopted and forcefully expounded in Britain and America by the logical positivist philosophers. Whatever philosophers may think about it now, this atomic theory of knowledge has permeated all fields of thought whereas its repudiation seems to be generally unknown. The delayed social result of this theory has been a widespread equating of learning and scholarship with knowledge of verifiable facts—even in education; quiz programmes and teaching machines are but two of its many manifestations. Coherent knowledge has been disintegrated into a great heap of atomic facts.

Since the end of the last war two further developments have occurred which, though they have no logical connection with the atomic theory of knowledge, have helped to strengthen its attraction. The first was the development of the mathematical theory of communication, known also as information theory.[4] This theory was first offered to electrical engineers as a means of measuring the efficiency of telecommunications systems, such as teleprinters and radio links. And in this field and in other physical interactions it is a theory of fundamental importance. But because of its ill-chosen terminology it was rather uncritically applied to human communicative processes as well. Enthusiasm for it has now waned, at least for the present. However, this new concept of information, technically defined, which could be measured very precisely in terms of its unit, 'the bit', and which could be transmitted or stored, seemed to support the atomic theory of human knowledge. In fact, the bit is not an atom of information any more than, say, the inch or the millimetre are indivisible atoms of length. But, as long as one does not look too closely, the name of the unit measure of information—the bit—reinforces the idea that information is atomic.

The second development has been the outstandingly successful use during the post-war period of digital computers. They can now perform reliably, accurately and speedily all kinds of complex logical operations on all kinds of inputs and information. As highly adaptable and versatile computers are available and as the mathematical theory of communication can be applied to them, it is very tempting to those in the information business to adopt a general theory of human communication which conforms with the computer pattern. Acceptance of such a general theory is further strengthened when computers and data handling devices are seen to be so successful in so-called '*information* retrieval' techniques—techniques which for the most part would be more correctly called '*document* retrieval' techniques. The social result of these developments is the widespread and comfortable belief that all problems of disseminating information can be solved by mechanical computer techniques — that our problems are electronic or technical rather than human or social.

The difficulty about atomic theories of communication and knowledge is that they are not wholly false. They are adequate for practical working purposes when, to use everyday language, a statement has precisely the same meaning both for the speaker and the listener, or to use the language of information theory, when a signal is encoded and decoded according to precisely the same code. Under such circumstances difficulties of communication rarely occur and so no general problems arise. (Difficulties arising from 'noise' in the channel are irrelevant here.) Difficulties of communication normally arise only between communicants with *different* coding systems, when the atomic theory no longer applies. The atomic theory applies only to an ideal world whose inhabitants are almost equally knowledgeable, wholly rational, all speaking perfectly the same language—a language as pure and precise as mathematics—and interested only in ideas and not in things. Is this a suitable theory to apply to science and industry—even to British science and British industry? We find ourselves in this paradoxical situation: when communication succeeds, we have a valid theory, though we do not need one; when communication breaks down, and we need a theory, we find that our theory has broken down too. But few see the situation in this light; most people prefer to cling to their simple theory and to ascribe any breakdown to some other cause—to deficiencies in the speaker or the listener or in the research scientist or the factory engineer, as the case may be. That such a theory as I have outlined is seriously held in high places is, I think, evidenced by the suggestion that within a few years' time it should be possible to put all scientific *knowledge* (not simply a catalogue of documents) into the memory store of one computer, to keep it up to date and to have access to the store by telephone.

I am as it were in private duty bound not to, nor do I wish to, give the impression that I am against the wider use of computers and other electronic devices; I only want to emphasize that computers are not going to solve all our information problems. At present, computers are applicable only to positivist universes of logic, mathematics and atomic facts and can serve as communication channels only when the encoding systems of their inputs and the decoding systems of their outputs are known. The chemical industry is probably the most suitable for their further application since chemistry is, I think, the most easily atomized and best coded subject.

A difficulty about criticizing the atomic positivist theories is that they form a logically water-tight system which rigorously excludes and so forestalls any attack by dismissing anything outside itself as nonsensical or metaphysical; any basic attack on it can be made to appear, from the theoretical standpoint, to be irrational. As is often the case in an intellectual impasse of this kind, we have to depend on the intuition of artists to produce the first public expression of revolt. The so-called 'theatre of the absurb' is implicitly a criticism of the inadequacies of the current orthodox rationalistic theories of knowledge and communication; *Waiting for Godot* may seem a far cry from *Chemical Abstracts* but the development of information science depends on establishing a scientific (i.e. hypothetical) general theory of human communication which could embrace the professional activities of Beckett and Ionesco as well as those of research chemists. If information science is to live up to its claim to be a science, it must establish its own autonomous theoretical basis: mathematical information theory by itself is not enough.

I criticized the simple theory for its assumption that encoding and decoding are based on precisely the same universal code. But, you will be saying, is not this assumption satisfied in science? Natural science as a whole can be regarded as a continuing attempt to create, widen and refine a language or languages in which exact communication is possible—in science, of course. The snag is that the languages of science take a long time to learn. A young man intending to do research has to devote his main intellectual effort from the age of sixteen years to twenty-two to acquiring competence in the basic techniques, practical and expressionist, of his specialist subject. During this time he is learning how to code and decode the technical terms of the subject. He is ruthlessly brainwashed, usually with his willing consent, until he learns to use the code of his subject exactly, that is, as his teachers use it. If he does not, he fails an examination somewhere on the way and will not qualify to do research. If he succeeds, then he may become creative in his subject and contribute towards the further refinement of its language. Since the language of a science is always changing and growing, the young man will have to continue his intellectual efforts if he wishes to retain his creativity. But even then he will know well only one of the many languages of science: their logic may be the same but their vocabularies are very different. And one cannot learn them as one does a foreign natural language like French or German; one's scientific language is a first language into which one builds one's scientific experience as an extension of one's mother tongue. Similarly, the man brought up to the craft side of a technology has to devote some years to his craft. And while he is learning the manual skills and the practical techniques of his trade he is necessarily limiting his personal experience by not doing something else. Ideally we should all know everything intellectual and be able to do everything practical, but life is short—we have to content ourselves with at most two or three special skills and as much common sense as we have time for. There is no point in decrying the difficulties of communication that specialism brings with it: we ought rather to rejoice in the varieties of experience that are open to us. But we have to realize that the possibilities of human communication are limited if only because our individual life-spans and therefore our individual experiences are also limited.

A second commonly held belief that I have to criticize is that all knowledge is expressible in and communicable by linguistic or other symbols—an idea derived from *The meaning of meaning* by Ogden and Richards and which is still being expounded in textbooks. This I regard as a scholastic illusion, widespread among humanist academics and, I suspect, among librarians also. One cannot learn a natural science wholly from books: one must observe the actual phenomena one is studying (either in nature or in a laboratory), acquire the relevant manipulative skills and observational techniques, and learn by long practical experience the intimate correlations between scientific words and the things and processes they refer to. And this dependence on an intimate knowledge of material things and processes holds even more strongly for applied science and technology. The strength of science lies in the fact that the truth of a scientific statement is tested or its meaning clarified, not by linguistic analysis, but in the laboratory, on the test-bench or in the workshop.

Now I must try to be constructive. Communication is possible, I believe, only on the basis of similar personal experience—a term I shall have to leave unanalysed here: we learn to use language mainly by acting it. When we speak or write, or act publicly in any other way, we display ourselves and invite the attention of others to our display. Those who choose to attend to our display observe not only the display itself but the whole context in which the display is made and they interpret the whole in the light of their own personal experience. And that private interpretation may be very different from the actor's expectations. In this process nothing passes directly from the actor to the interpreter—not even ideas or information or knowledge—there is simply a public display on the one hand and a private interpretation of the display on the other. If a person A has some special personal experience, for example, if he does a scientific experiment, about which he wishes to inform another person B, then he may express his special experience, let us call it K (A), in some publicly observable form—for example as a document. If B cares to attend to this document, and this is a matter in which A has to depend on B's goodwill, then B will interpret the total situation embracing the document: let us call B's private interpretation of the document K (B). Then the commonly held theory assumes that it is possible for the two private interpretations of the document, K (A) and K (B), to be identical and that there is something—K (?) expressed in the document—knowledge which is independent of both A and B. But since we cannot see directly into the minds of A and B, there is no possible means of checking *directly* whether K (A) and K (B) *are* identical. At best we can only evoke further public displays from A and B and observe their logical relationship to our own private interpretation of the document, say K (C). From such indirect evidence we can sometimes be certain that the message has been *mis*-understood, but we can never be certain that it has been interpreted precisely as A intended even though the immediately expected consequences ensue. Normally we are satisfied if the expected immediate consequences or some of them do occur; in this case we usually assume (though without logical justification) that K (A) and K (B) are sufficiently close to lie within what the engineer calls the 'tolerance' permitted by the situation. In everyday language we say that 'A has communicated K to B'. But I have to emphasize that to say that the knowledge K 'has been conveyed from A to B' is merely a metaphor with an optimistic bias; *nothing* is directly conveyed or transmitted. Nor does K itself exist; there are only the document and private interpretations of the document—K (A), K (B), K (C) and so on. The communicative process consists solely of public displays and private interpretations of those displays. When communication is said to occur we mean only that the private interpretations of the communicants as judged by observable consequences appear to be closely similar. Communication is much more complex and precarious than the atomic theory leads us to believe.

If the account of communication I have been able only to outline here has any validity, then there are three implications relevant to our present theme:

1. Communication cannot begin before the communicatee's attention has been attracted to the initial display. But then the degree of continued attention that he gives to a public display will depend on his assessment of the likely relevance of the display to his personal objectives and interests: as there are many other clamours for his attention he will constantly be assessing the penalties of not attending to this or that against the benefits of attending to something else.

2. The most effective method of retaining the communicatee's attention is to invite him to make a responding display, that is, to make the communication channel a two-way system, or to invite dialogue. But, to be successful communicatively, even dialogue requires that the communicants have a common purpose.

3. Even if the communicants have a common purpose, the communication between them is limited by the overlap of their personal experiences; their differences of experience, which are what they wish to communicate, can be discussed only in terms of the experiences they have shared. The limits of a man's experience are the limits of his world.

Now let us apply this account of communication directly to our present problem—the communication of the research results of applied science. First, how is information used? One cannot just note information and then immediately apply it. As the later Wittgenstein puts it: 'If a lion could talk, we could not understand him'[5]—because the experiences and techniques of lions and humans are so different. Less dramatically, the later Wittgenstein also says: 'To understand a sentence [or fact] means to understand a language. To understand a language means to be master of a technique'.[6] Or in Ryle's terms: 'Knowing *that* is part of knowing *how*'.[7] Especially in science one does not understand the sentence, or the information, unless one is already master of the relevant technique and so understands not merely the sense of its words but also its practical and theoretical implications. Only in a large research laboratory, where a team can be set to solve a problem, is a literature search likely to be the obvious first step to take. With a team containing representatives of several related but different disciplines, it is possible to have group discussions to clarify the practical and theoretical aspects of the problem and to specify what needs to be found out. Every practicable approach can thus be explored in detail, all the relevant information from the literature search can be checked practically in the laboratory, and so the problem can be solved by 'trampling it to death'. But an individual scientist will only exceptionally first collect all the published information that may be relevant to his problem. His first inclination will be to go to his laboratory and 'knock up' a rough working apparatus to display the effect he is interested in and to show what techniques he needs to develop. He will vary the relevant parameters, he will try this or that, relying on his hunches, and observe what happens. Only when he meets insuperable difficulties will he be moved to search the literature—but now he knows what he is looking for; he can now specify the information he seeks and is able to apply it when he finds it. To the outsider, the practical work both of the team and of the individual may look like unnecessary duplication of work already published, but to the insider it is the key to the understanding and application of the information. Published scientific information can never be taken at its face value: it always rests on implicit assumptions and so the research scientist has to ensure, by testing it practically for himself, that these implicit assumptions are not in conflict with his own.

Secondly, we have to recognize that the conversion of a scientific idea into a technological reality takes time, however acceptable the idea may be to the technologist and however urgently the conversion is pursued. The process or product must offer economic advantages in the long run and so it has to be marketable and competitive: yet the cost of development is often impossible to estimate. As the expenditure on research accelerates, the delay between the total research investment and its economic return will inevitably appear to lengthen. Yet, after making all allowances, there is evidence that Britain, with its foreign trade heavily dependent on its technological skills, is falling behind some of its rivals in net exports of the products of *scientific* technology such as scientific instruments, machine tools and plastics, and is therefore becoming relatively backward in these fields.[8] Disquiet has also been expressed recently at the apparent dependence of British manufacturers on the use of foreign manufacturing licences 'sought as the alternative to the difficult and initially more expensive task of organizing a design team and supporting it with adequate research and development facilities'.[9] The fear is that Britain is a net *im*porter of licences, because we are not fully applying our technological 'know-how'. There is no doubt that between science and its application there is a gap in Britain to worry about—the so-called 'development gap'.

The main causes of the gap are deeply rooted: first, in our social structure, which sharply distinguishes those with manual from those with other skills; then in our industrial organization, which has not yet learnt how to fit sceptical inquiring scientists into an authoritarian managerial system; in our schools, where science is taught as a dogma and so kills curiosity rather than as a mode of inquiry, and where English is taught as introverted self-expression rather than as a communicative skill; and in our universities too, where knowledge is pure and only application vile. These difficulties are not insuperable but they are accentuated in Britain because we are too ready to fit ourselves into grooves—of research, or production, or librarianship—and settle there. A prime need is for a greater mobility between jobs and companies, as in the United States, and between private industry and the Civil Service, as in France, so that we also could have more specialist hybrids able to act as interpreters of one specialism to another. But the remedying of faults in our social structure is a long-term task and, interesting though such matters may be, they lie outside our conference discussion. I have to mention them, however, to indicate the limits of any improvement that could be expected from simply improving our present information services.

Thirdly, let us consider what could be done in industrial laboratories to improve their scientific information systems. The applied scientist in industry has a difficulty when writing his papers. As a pure scientist he must regard his paper as a tentative hypothesis submitted to the critical assessment of his research colleagues in the same field: his work must await their scrutiny because only they are competent to judge its validity. From this point of view it would be presumptuous of him to make his claim to validity over the heads of his colleagues by addressing his paper directly to a less critical audience. Science is essentially a social co-operative activity in which a few tentatively propose new hypotheses and the many constructively criticize them: no one however brilliant, can wholly 'go it alone' in pure science. But the scientist's employers are not interested in tentative scientific hypotheses: they demand from him, as an expert, authoritative solutions to their practical problems. His suggestions do not need to be theoretically valid so long as they are good enough for the practical applications; and his employers want his answer in plain words. So the applied scientist wrestles to retain his scientific integrity and yet to satisfy the pragmatic demands made upon him by his employers. Such a compromise is possible only in the technologically most advanced industries where theory and practice march hand in hand and where scientific hypotheses are understood for what they are. When I recently asked a harassed scientist in a mechanical engineering firm why he wrote no internal reports on his research, he replied: 'Why should I stick *my* neck out?' The oracle is not allowed to make mistakes.

My visits to industrial research laboratories are pathological, that is, I am called in because the reporting system is unhealthy, and so my impressions may be prejudiced. Usually I detect the symptoms of atomism: the senior scientists or managers are implicitly demanding an unattainable perfection of form and style, believing in the myth that everything can be made plain both to the scientific member on the Board of Directors, to the development engineer in the factory, and often to many others, in one and the same report. They suffer from an uncontrollable compulsion to rewrite all the draft reports submitted by their scientific subordinates; and the subordinates feel a great weariness when they are asked to interrupt the pleasure of doing practical work to tackle the frustrating job of preparing yet another draft which they know will be distorted out of recognition before it sees the light of day as a research report. I have known the correcting, re-writing and re-editing of single research reports to last three years. Is it surprising that there is a widespread belief in research labs that anything which appears in print is already out of date? There is usually a confusion of purpose too, scientific integrity and pragmatism both being further strained by internal company policies only half understood by the scientist immersed in his research.

The remedy is not difficult. Here briefly are the steps to be taken:

1. Clarify the communication channels and the objectives, that is, discover who will be expected to *apply* the research results, ignore all others on the circulation list, and prepare the reports solely for those who can make practical use of them.

2. Dismantle any hierarchy of editors and substitute a minimum of one editor and a maximum of two who must be in the line of management.

3. Emphasize that a report in applied science must be regarded as though it were an instrument or tool designed for a very specific job, remembering that when an intrument or tool is ordered all its most important characteristics are specified in detail. When a report is called for, see that it is specified to the

author as precisely as possible: there is then a chance of getting a draft which fits the specification rather than a shapeless manuscript which has to be hacked into the required shape.

4. Impose a time-limit on the editorial work—three weeks rather than three years.

5. In collaboration with the users, standardize the types of report to be used and codify all details and procedures relating to the preparation of reports in a booklet which itself preferably takes the form of the most frequent type of report and which is distributed to *everyone* concerned including the typists and duplicating staff.

Where this kind of procedure has been fully explained and adopted, I think I can say that it has been successful both in getting reports written without trouble and in getting the results applied. In general, the internal reporting of applied scientific work could be much improved in speed and directness. And the remedy is clear: it merely requires management to take a more realistic view of the communicative process, to determine precisely the main channels of communication in their organization and to keep them open both ways.

Strictly, science is *public* knowledge open to all who wish to know. In industrial practice, however, technological information is still often regarded as though it were the philosopher's stone turning all into gold. The little black notebook in which the foreman cryptographically recorded the technical secrets of his trade (and thereby ensured his continued employment) has almost vanished, but its place has been taken by research reports stamped with the insignia of security and kept under lock and key behind steel doors. I recently found, in one organization, two departmental laboratories, in the same town and within a mile of each other, each working on precisely the same project in utter ignorance of each other's work. This kind of commercial secrecy not only conflicts with scientific ideals and reduces potentially creative scientists to technical hacks but it is also self-defeating commercially. What are patents and manufacturing licences for? In science, he who has most to offer is also offered most. Industry can use science to the full only by opening its laboratories and publicising their work. Secrecy about applied science reinforces the widespread and cynical view that any technical information that is openly published must be commercially worthless. And this is another manifestation of the atomic theory of knowledge—that knowledge of the 'facts' is the whole of knowledge.

Fourthly, what more could be done by the research associations and the national research establishments? Because they range so widely in size and scope of activity it is impossible to generalize. The more closely the activities of an applied research laboratory are linked with a technically advanced and concentrated industry, for example, as aerodynamics is with the aircraft industry, the easier are its communications. In such cases, members of the research establishments usually sit with research colleagues and senior managers from the industry on joint committees planning lines of development and programmes of research; the communication channels are freely two-way so that the research scientists are well informed about the industry's immediate and foreseeable technological problems. Here research and application can be as intimately related as in the most advanced private industries. Even the Federation of

British Industries strongly approves of what it calls the relationship of 'mutuality' between the Royal Aircraft Establishment and civil industry.[10] But greater communicative difficulties arise where the work of the research laboratory is not so narrowly directed towards one particular industry, where, for example, it offers improvements in techniques of machining metal which could be widely applied. The applied research laboratories I know consider such communicative problems very seriously. They publish their literature and disseminate it widely; the members of their staffs pay informal visits and give lectures when invited; they hold open days with exhibits and demonstrations of new advances and techniques to which all who might profit are invited to attend; and, since techniques cannot be communicated wholly by words, the National Physical Laboratory (and possibly other establishments) arranges for technicians from industry to learn new techniques in their laboratories.

The growth of work done by the research associations but sponsored by industry is a sign of the growing confidence of industry in the research associations; seven of the associations already do sponsored work and one of them—that for production engineering—now derives a third of its income in this way.[11] Three of the associations have advanced even further and have formed development companies to exploit their research ideas commercially.[12] These are welcome signs of a growing directness and intimacy of communication between science and application. And then the National Research Development Corporation, set up in 1949, stands by to support the industrial development of new ideas directly—the development of hovercraft is a topical example. The NRDC is particularly concerned with promoting ideas generated outside private industry though it is salutary to learn that only 5 per cent of these become established industrial products.[13]

But all these approaches still fail to bridge the development gap completely. If the private company is sufficiently advanced to have its own technical information service, however primitive, a channel of communication is open to external sources of information and technical assistance. But if the private company is happily introspective about its work, confident in its own techniques, and satisfied with its order-book, production and profits, it is not easy to attract its attention to possible technical improvements. Information can be given only to those who actively seek it and know what they are seeking. So, recently, DSIR has set up offices in the more impenetrable industrial regions where industry is based on small factories. From these offices, technical information staff call, like any other technical salesmen, on a local factories and tactfully try to alert them to the fact that good ideas are freely available to them. Another step has been taken in Scotland where lecturers have been appointed to technical colleges for the specific purpose of helping local industry with technical suggestions. The National Lending Library for Science and Technology has also been set up at Boston Spa: it acts not only as a distribution centre for information generated in this country but also as a collecting centre of scientific and technical information from overseas. And the activities of Aslib are also, as you know, financially supported in part by DSIR.

It might well be asked—What more can be done immediately? A responsible answer to the question must be based on a balanced view of the whole process of disseminating information through the field of applied science—a view which is difficult for any one individual to get. My own view, admittedly from the sidelines, is of a chaos of confused individual objectives and *ad hoc* policies, useful perhaps within their limitations, but lacking generality and unrelated to any discernible long-term objectives or guiding principles. And the present confusion becomes steadily more confounded by the fact that the dissemination of technical information has become a field for exploitation by those more interested in making profits than in providing a service to applied science. Every new journal generates still more paper—abstracts, translations, translations of abstracts, abstracts of translations—all thrown, it seems, at random into the flood from which it has to be selected, retrieved and processed again by a multiplicity of agencies. Oppenheimer's nightmare vision that, if the present rate of growth of new scientific and technical journals continues unchecked, 'they will outweigh the world in the next century'[14] is fortunately unlikely to be realised if only because we can rely on the laws of physics if not of economics to prevent it. But there is an inherent absurdity in an information system designed to reduce waste of natural resources and inefficiency in manufacturing processes which is itself so wasteful and inefficient. The cost of the wasteful system is borne primarily by the more efficient industries—though ultimately it is shared by all of us. I see no reason why the present development gap between what is known and what is applied in this country should not continue to widen because of the overall inefficiency of our information services.

It is tempting to suggest that the more backward industries should be left in their ignorance to die and that efforts to improve technological application should be concentrated on those industries which already set the pace of technological advance and bear the main costs. But this suggestion overlooks the awkward fact that the backward industries do not die; they survive because they reap some benefits from technological advance, perhaps in the machinery or materials they buy. Because they are providing, however inefficiently, services that are needed and paid for by the community, they can keep in business without the expense of running a development department. So the problem of reducing the development gap is a national one and has to be tackled, if at all, at the national level, that is, by the Government through the Ministry for Science and DSIR.

DSIR could claim with justification that as a department it is already doing its utmost: it could point to the many ways in which it already co-operates closely with industry and to its widespread publicity on behalf of applied science in all the media available. My criticism of its work is that it appears to be purely *ad hoc*—an unco-ordinated patching up of deficiencies here and there—and that what is urgently needed is a more forward-looking coherent policy for the whole field. Perhaps the report of the Trend Committee will help.

We especially need some means of centralizing and directing information activities, perhaps by the establishment of a research centre for the technical information industry, so that information about the scope of information use and information needs can be collected and assessed on a national scale. We need *national* programmes of development in communication techniques, information storage devices, computer applications, mechanical translation, and all other modern aids—programmes co-ordinated and techniques actively developed, either independently or in collaboration with industry. I know that Aslib's research department is working on some of these problems, but I also know that their present resources are woefully inadequate for the scale and scope of the operation required. But primarily what is needed is not immediately to plunge headlong into more electronic research programmes, certainly not to publish yet more documents, but to review the field, to establish general policies about the dissemination of information to different kinds of users, to make *decisions* (which neither Aslib nor DSIR has the authority to do) about national objectives and priorities in applied science, to plan the development of the relevant channels of communication, and to standardize and codify the documents and systems used for reporting, interpreting, and storing information; in short, to apply on a *national* scale the knowledge already available about communication systems—the development gap is as wide here as anywhere.

Above all, we have to give some thought to the *theory* on which all these developments ultimately rest, that is, to our present hopelessly inadequate theory of human communication. We must not delude ourselves with the idea that because we use scientific devices such as computers in disseminating information we are being scientific in our methods—one can use computers for playing bingo, but that does not make bingo scientific. Without some fundamental *theory,* our national information service is going to remain the incoherent collection of techniques and gadgets it is at present, *scientifically* more backward than any of the industries it serves; there will be a growing profusion of gadgets but no growth of understanding. And without a *national* policy our information services are going to remain hopelessly inadequate to disseminate efficiently the results of the £1,000 million per annum programme of research and development that will soon be upon us.

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DISCUSSION

Mr Jason Farradane (Northampton College of Advanced Technology) said Mr Brookes seemed to emphasize the need for communication personally or by demonstration. Many of the audience, however, had to deal with recorded knowledge for persons they could not reach, and transmit it to recipients they did not meet. Language is a poor tool—not primarily designed for science. There was a need for study of new means of handling knowledge more exactly—a 'metalanguage' with less ambiguity, capable of storage and re-use. Computer-operations tended to ignore this need for accurate analysis of knowledge; linguistic analysts tried to get everything out of language, as written. As Mr Brookes had indicated, new basic research on the nature of knowledge and its organization for recording and transmitting information was needed.

Mr Brookes replied that perhaps he had over-emphasized the role of oral communication; he certainly had not intended to give the impression that written communication was unimportant. Communication by written or printed words was even more precarious than oral communication because misunderstandings were less quickly discerned and corrected. He had joined several attempts to study this subject, but all, so far, had collapsed—oddly enough however, because of failure in communication. He was willing to try again, but he suggested that any such study must be carried out co-operatively by a group sharing the same objectives.

Mr D. J. Simpson (IBM United Kingdom Ltd) made a strong plea for papers containing so much detailed material as Mr Brookes's to be pre-printed for distribution before the session at which they were presented. Mr Brookes agreed that this was desirable.

Mr A. J. Dickson (Ealing Technical College) thought Mr Brookes's distinction between the 'private' and the 'public' system of thought appeared to be most fruitful. Perhaps it was the librarian's task to prune the title of a work of its 'private' symbolism to something readily understandable by the public.

Mr Brookes considered that it was dependent on what was expected of a librarian in his particular job.

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THE STRUCTURE OF NATIONAL DOCUMENTATION AND LIBRARY SERVICES

HERBERT COBLANS, M.SC., PH.D.

Head, Scientific Information Service, European Organization for Nuclear Research, Geneva

Chairman, Dr M.F.C. Paige, Librarian, Research Department, ICI Nobel Division

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YOUR Conference Committee asked me to talk about national documentation systems and to be provocative. Thus any dogmatism should not be taken too seriously. I would like to start by taking stock of the problem in the second half of the twentieth century. Since the end of the last war we, as documentalists, have lived in a climate of crisis, of alarums and excursions. The cause has been commonly ascribed to the so-called 'flood of information', the 'literature explosion'. Perhaps the real revolution lies elsewhere, in the deep-seated change in our publication potential.

It was Fremont Rider[1] who provided statistical evidence in 1944 to show that the great university libraries of the United States are doubling their bookstock roughly every sixteen years. A relative growth of 5 to 7 per cent annually leads in effect to a doubling within ten to fifteen years. But as Swanson[2] has reminded us recently, this annual rate of increase is not new. For the past 250 years the number of periodicals, of published papers in science and technology, the number of scientists and the total expenditure on research has been increasing at about the same annual rate. Therefore it cannot be said that the rate of increase of scientific information is out of balance in our time.

For various reasons the post-war period has seen the culmination of certain older technical developments which, for simplicity, I shall symbolize by lithography, photography and punched cards. Their creative combination and widespread availability has led to a revolution comparable with that ushered in by Gutenberg more than five hundred years ago. These 'machines' may be the culprits, but the natural corollary is not necessarily more and better machines. On the contrary we need new insights into the intellectual assumptions of our methods of scientific communication, our library procedures—our techniques of information storage and retrieval.

The nature of the problem

The forms of documentation can be conveniently considered in two broad classes—books and non-book materials. While it would be rash to underrate the book problem in libraries, it is generally accepted that the non-book forms are the main cause of the trouble. Under this heading publication character gives a significant breakdown.

Published	*Unpublished and semi-published*
a, periodicals	*d*, report literature
b, conference papers and proceedings	*e*, internal documents
c, translations	*f*, pre-prints

(There are of course quite a number of connections which cut across the above sub-division; conference papers can appear as reports, in periodicals, in book form; translations in periodicals, as reports or as internal documents.)

While the sheer quantity of published material, especially of *b* and *c* above, has grown even beyond the 7 per cent rate in many subject fields and bibliographical controls are still too haphazard, the situation is not hopeless in such disciplines as mathematics, physics and chemistry. At all events such negative factors as the Bradford Law of Scattering in periodicals, seepage,* the language barrier are becoming well understood. On the other hand this type of literature has some positive characteristics:

a. It is published and therefore available in principle to everyone.
b. There is a minimum guarantee of quality, as it has been screened by editorial boards and referees. Thus there is a certain amount of birth control.
c. It has become part of the permanent record.

Unpublished and semi-published literature has none of these advantages. Its proliferation is the direct result of the new publication potential. The commonest form is the 'report', sometimes called technical report or research and development report. It is hard to define as it can be a multitude of things; protean in form, content and purpose. About 100,000 informal federally sponsored reports are produced each year in the United States. (Of these 25,000 are 'classified', i.e. subject to some restriction in distribution before final declassification.) To this figure must be added the very large number of reports issued by research institutes and industrial laboratories. The US Atomic Energy Commission[4] distribute about six million copies of reports annually, three million full-size and three million as microcards. On the other hand American scientific and technical periodicals carry approximately 450,000 papers each year.

Then there is the 'pre-print', that bibliographical freak misbegotten out of war restrictions by editorial slowness, and nurtured by human vanity. A pre-print no longer has its old meaning of an advance sheet 'pulled' from the type before the main printing run starts. Now it has come to mean the duplicated form of the manuscript of a paper submitted to a periodical (in which it may or may not appear about ten months later) and distributed by the author to a select list of his colleagues. Once sent out like this pre-prints inevitably are collected in libraries, are cited in lists of references and are sometimes even abstracted, thus blazoning a trail of bibliographical confusion. Another aspect of the pre-print is stressed by A. M. Weinberg,[5] the Chairman of the Panel on Science Information of the US President's Science Advisory Committee:

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* Ranganathan[3] has recently introduced the term seepage as a special form of scatter. 'When the host periodical is totally alien to the subject of the document, seepage is said to occur.'

> . . . private and semi-private methods of circulation have sprung up—government's informal report system in technology, the pre-print system in basic science.
>
> With respect to pre-prints, science faces a real danger of reverting to the privacy of the seventeenth century: some biologists think this has already happened to molecular biology where pre-prints are circulated only to one's friends.

This clearly runs counter to the public and unified character of scientific research.

Responsibility

Scientific research in a progressive society implies communication and this responsibility is shared by scientists, Governments and documentalists. The scientist starts the information chain with the presentation of his paper. Primary publication in a periodical, and usually secondary publication (abstracts and indexing services) are handled by professional societies, commercial publishers or even governmental agencies. The librarian, the documentalist, the information officer are responsible for making available the information contained in publications and for preserving the record.

Both the scientist and the documentalist have a two-fold duty, a 'public' responsibility to posterity and a 'private' responsibility to their immediate employer. The proportion varies in practice with the circumstances of employment; a ballistics expert in a Defence Establishment and a physicist in an international laboratory would represent the two extremes. Thus they have a solemn duty to ensure that nothing stays private which should be public and also the converse; no document should be made public (inserted into the bibliographical record) if it only has private validity. Otherwise a sane and efficient bibliographical economy becomes almost impossible.

National services

The traditional and conventional methods used in the older developed countries to master this jungle of documentation in the natural and applied sciences constitute a number of systems which at best work in series, but more often are in parallel. Ideally each country or group of small regions should have a National Science Library with broad responsibility for preservation, reference service, bibliographical control (of national publication) and the co-ordination of loan facilities. Further it has the obligation to ensure that somewhere within the national frontiers there is public and reasonably rapid access (through Union Catalogues and the use of Telex) to the important published literature in science and technology. For smaller countries the minimum would be the fullest collection of bibliographical guides to this body of world literature. In Britain you are promised this, in principle, for 1966 in the proposed National Reference Library for Science and Invention.[6] In the USA the Division of Science and Technology of the Library of Congress partly tries to do this.

In practice, a central national library is usually at the apex of a pyramid consisting of services provided at different levels by university and research institutions, professional societies, Government establishments, industrial laboratories and public libraries. The older and more developed a country is the more complicated are interlinkages, overlapping and duplication. Countries range widely from a high degree of de-centralization (USA and Western Germany) to a very large measure of centralization (France and the USSR) I only have time to mention some striking trends and emerging patterns in a few countries, namely in decreasing order of centralization: USSR, UK, W. Germany and the USA.

USSR

Although there are a large number of science libraries, those attached to the Academy of Sciences hold a commanding position. Above all the All-Union Institute of Scientific Information (VINITI) has a highly centralized responsibility for bibliographical control. Its Referativnyj Zhurnal, with forty subject series, includes all science and technology except medicine, agriculture and building construction. It abstracts exhaustively some 12,000 periodicals from ninety-five countries in sixty-five languages.[7] Already in 1946 Samuel Bradford[8] was pleading for such a system of complete documentation in science and technology. On published literature the Russians do a very thorough job. However the indexes (and their cumulations) to Referativnyj are still too slow in appearance, but they are planning to mechanize their compilation and thus come into line with the best current practice. As documentalists we should be grateful to them for initiating in 1963 a series devoted to documentation abstracts, so that our subject has at long last been given a worthy place alongside the traditional scientific disciplines.

United Kingdom

Clearly I do not need to say much about British trends; you are at the centre of the developments. However in a country that has so rich a tradition in public, Government, professional and private library services it is significant that a National Lending Library for Science and Technology[9] became a burning necessity and is already proving to be a splendid investment. No less do you need the National Reference Library for Science and Invention. In fact, however strongly vested interests may oppose increased centralization and co-ordination (with some executive power) of overlapping services, more deliberate planning of many aspects of national documentation centres is bound to come.

Western Germany

There is a very special interest for us in that country from the point of view of the development of documentation as, with a rich traditional past in scientific bibliography, it has had to rebuild almost from scratch after the war. Starting with a strongly regional outlook and bias against Federal control it has been forced by the logic of events into increasing centralization. Thus in 1959 the Federal authorities found it necessary to create the Technische Informations-Bibliothek in Hannover as the central scientific library of the Federal Republic to satisfy all needs in scientific and technical documentation.

In 1957 the Minister of Atomic Energy designated the Gmelin–Institut, the world documentation centre for inorganic chemistry, as the national depository and clearing house (*Zentralstelle für Atomkernenergie–Dokumentation*) for all books, patents, dissertations, reports, laws, etc., in the broad field of the nuclear sciences. Clearly such an involved documentation task could not be left to the haphazard care of industry and learned institutions. In a recent report Pietsch[10] has described how ZAED has acquitted itself. It has succeeded in supplementing at the national and regional level the work of the US Atomic Energy Commission and avoiding duplication with *Nuclear Science Abstracts*.

Two years ago a federal 'Institut für Dokumentationswesen' was launched in Frankfurt, as part of the Max Planck Gesellschaft zur Förderung der Wissenschaften,[11] to promote and co-ordinate documentation in the Federal Republic and in its international relations. It functions over a wide area but it will not in itself do any documentation or research; it will stimulate, co-ordinate, recommend, issue contracts for specific projects, but it seems to have no executive power.

USA

An ever-present suspicion of Federal 'interference', a rugged individualism and an insistence on free enterprise puts the USA at the furthest limit of decentralization, very like Switzerland. None the less, in practice, Federal participation is basic to the American scene, as 'the federal government . . . (is) the supporter of three-fourths of all research and development in the United States'.[5] Therefore its direct involvement in the scientific information network is all pervading. One need only mention such colossi in documentation as the Library of Congress, the National Library of Medicine, the National Library of Agriculture, the Atomic Energy Commission, the National Aeronautics and Space Agency, and the Defence Documentation Center (the former ASTIA). Yet gaps in coverage and wasteful duplication are certainly worrying the American authorities, as shown by the Report of the Panel on Science Information. Its Chairman[5] has expressed himself strongly on this subject:

> 'The complexities that face one in trying to understand the federal technical communications system, let alone advising how to improve this system, are appalling. One finds little uniformity in purpose or method of operation among the many information systems of the agencies.'

During the past few years two important services were established to try and improve the ever-worsening situation. The National Science Foundation in 1958 set up an Office of Science Information Service under B. W. Adkinson (now President of the F.I.D.) to 'provide for, or arrange for the provision of, indexing, abstracting, translating and other services leading to a more effective dissemination of scientific information' and '. . . be primarily of a co-ordinating rather than an operating nature'.[12] The Annual Report of OSIS which appeared this month is an impressive document, which summarises the position after four years of operation of the Service.

In August 1962 the National Science Foundation established a National Referral Center for Science and Technology in the Library of Congress. This clearing house does not answer questions directly, but refers inquirers to the right source. It aims to maintain an inventory of all relevant services and sources in the natural and social sciences, medicine and technology with the main emphasis on special libraries, documentation centres, abstracting services and unpublished knowledge.

Diagnosis and therapy

In the light of the above it is legitimate to ask whether the traditional techniques can be made more efficient, modified and extended to meet the present and future pace. How serious is bibliographical loss today? In his Presidential Address to the British Society for International Bibliography in 1942 Pollard[13] gave what is probably still the most stimulating account of what he called 'The disordered state of bibliography and indications of its effect upon scientific and technical progress'. How many of us have repeated his story of the neglect for thirty-five years of Mendel's work on heredity? Yet, I think, that the worthy abbot of Brünn should no longer be taken as the symbol of a 'documentation manquée'.

In an age of conferences galore, the multiple publication of the same idea or paper,* the danger of hiding one's light under a bushel has become much smaller. If it is fundamental science it will get through, at least in 95 per cent of the cases. If it is 'know-how' it is not formal publication that is the real mode of communication.

How obsolete is the periodical? When a new editor was recently appointed to *Science* one of his first editorials was devoted to 'Some needed reforms':

> The present communication problems could be greatly ameliorated if the scientific community would adopt a tougher standard of what is acceptable. If editorial policies were tightened the amount of material appearing could be cut to a quarter of the present volume with no essential loss . . .

He goes on to say that there should be a 'stern attitude to repeated publication' and that authors should 'suppress the tendency towards premature publication of fragmentary results'. That such and other improvements can be successfully introduced has been shown by the radical editor of *Physical Review*, S. Goudsmit, and in other periodicals.[15] To speed up the publication of urgent material *Physical Review Letters* was started as a separate periodical, which by using modern methods of office offset printing has significantly improved communication in physics. In this latter periodical, Goudsmit has written a series of brilliant editorials in which he castigates and cajoles his authors into better publication manners and justifies his rulings to re-establish a measure of health and sanity in what has become pathological in the presentation of scientific papers.

Unfortunately for every one step forward in improving the periodical article we slip back two steps in the penumbral world of pseudo-publication in which the report and the pre-print flourish. Nowadays with equipment for multigraphing and photo-offset available to almost everyone, all sorts of semi-private undigested preliminary reports can be easily produced in thousands of copies and distributed to the main laboratories in the field all over the world. This is a form of dialogue among research workers which is desirable, even necessary; in the old days it was done by letters and at scientific meetings in personal discussion. But it never had the quality of the printed word, of 'publication'; it was not indexed, abstracted nor catalogued. An article in a periodical or even a paper in the proceedings of a conference has to go through the filter of editors and referees, while reports and pre-prints are usually unedited. Only what has run the gauntlet of editorial selection should be considered as 'public documentation'. (Actually the situation has become so disturbing that the AEC is trying to develop a system of referees for its reports.) I suggest that, if we define bibliographically what we mean by a 'publication' and exclude all the rest from abstracting, i.e. putting into the permanent record, the literature explosion would reduce itself to normal growth, amenable to improved traditional methods of handling.

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* See Lindor Brown's delightful travesty of the technique in his Opening Session address at the International Conference on Scientific Information held in Washington in 1958.[14]

How then should this large bulk of semi-published material, so useful in the technical documentation centre, be controlled? My answer is that this is a private matter. Each centre should put as much time and labour into this ephemeral control as it thinks worth while. The exponential danger for documentation as a whole can thus be seen to be rather a bogey man.

Science has grown feverishly in recent years and so inevitably there is now more and more specialization and there are more overlapping and marginal disciplines. Nevertheless, as Bar-Hillel[16] has pointed out, on the average the scientist at thirty-two years of age does not read twice as much as at twenty years, although the output has probably doubled during such a period. In all likelihood he reads the same amount but in a smaller range, a more specialized field of his subject. Also the more quickly science moves the more quickly do the older theories become obsolete. Periodicals are consulted at a rapidly diminishing rate after the first few years, at most at a rate which is inversely proportional to their age. We, as librarians, have been slow to realize the importance of discarding. This is understandable as the archival tradition with its emphasis on the sanctity of the printed word is still uppermost in our training. With our present methods discarding costs almost as much as cataloguing. But the economic facts of life are forcing us into discarding. Thus for example the National Lending Library has already benefited considerably from the discarding of certain English libraries. Discarding need not result in less efficient service, if Union Catalogues, micro-reproduction and Telex are imaginatively used. Therefore we must seriously start to develop built-in techniques for discarding in our registration and cataloguing procedures.

The machine future

No discussion of traditional methods can evade the challenge of mechanization. Let me start with some published opinions of acknowledged experts. J. R. Pierce,[17] the Executive Director of Research at the Bell Telephone Laboratories, at the recent Dedication Ceremony of the John Crerar Library in its new form at the Illinois Institute of Technology, was very sceptical in his remarks:

> We are often told of the part that the computer will play in the library of the future . . . I think that the talk of revolution, of which we have heard so much, is largely idle fancy, based on no thoughtful examination of the problems that actually face libraries, and reflects little understanding of the limitations of present, and, indeed of future computer and electronic art.

My next quotation is from a disappointed lover—Ralph Shaw. Since that memorable presentation to the Press of the Rapid Selector in Washington in 1949 he has become more and more critical of mechanical selection.

> It is exceedingly doubtful that there is anything that can be done manually that cannot be done by machine if it can be described in sufficient detail. Similarly it is exceedingly doubtful that there is anything in the field of information retrieval that can be done on a computer or with punched cards, that cannot be done by hand.[18]

The moral for documentation is that at all times we must apply the following criteria to any proposed system:

a. Is it bibliographically desirable?
b. Is it technically possible?
c. Is it economically feasible?

To answer these questions with any degree of assurance for large scale systems much thought and experiment still lies ahead. The argument from economics can easily be misleading. In the case of the highly specialized needs of a large manufacturer of drugs the launching of a new drug on to the market months ahead of a competitor may well pay for a computer. However, such considerations should not determine the desirable and feasible norms of 'public documentation'.

Finally I quote Bar-Hillel[16] whose summing up of the present position represents the fruit of many years of careful study:

> . . . full automation of many aspects of information retrieval, such as translation, abstraction or indexing, is not feasible. Partial automation, on the other hand, is theoretically feasible and might be so also economically. But the needed investigations should be carried out in suitable institutions of higher learning and in accordance with standard scholarly methods.

The partial automation that should be insisted upon immediately is what I called low-level mechanization[19] some years ago. It uses well-developed systems depending upon cold type composition, line-camera photography at high speed triggered by punched cards and combined with offset printing. In this way prompt and detailed indexes (and their frequent cumulations) to abstracting periodicals can be printed quarterly as *Nuclear Science Abstracts* and *Index Medicus* have so successfully shown. There is no longer any valid excuse for having to wait two years and more for annual author and subject indexes. In fact the publishers of important periodicals, the agencies which issue reports on a large scale, all have a public responsibility to provide prompt author and subject indexes with frequent cumulations. If this were widely done, it would lead to a minor revolution in documentation.

We have seen that our publication potential today is the result of certain technical advances. The recording of knowledge, the making of libraries and all that that means, has been profoundly affected by two technical revolutions since medieval times. The first goes back more than 500 years to Gutenberg's invention of printing from movable type. (The scientific periodical made its appearance in 1665, the abstracting periodical in 1830.) The second is the evolution of photo-offset lithography in our time from Senefelder's lithography (1798) and the invention of photography by Daguerre and others more than a century ago.

Two other lines of technical development, Hollerith's punched cards (1886) for the American Census and the electronic computer have certainly led to a major break-through in the handling of numerical data and automation. Whether they represent a third revolution, comparable to the other two from the point of view of libraries and documentation, is not yet clear.

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DISCUSSION

Mr L. J. Anthony (United Kingdom Atomic Energy Authority, Culham Laboratory) said that the national systems described by Dr Coblans seemed to fall into two patterns—centralization of responsibility as in West Germany or centralization of dissemination as in Russia. Which of these did he think should be emulated, or were neither on the right lines?

Dr Coblans replied that centralization had obvious advantages, especially for developing countries. In the older countries rich in bibliographical resources and in highly developed library systems, overlapping was inevitable and needed only to be reduced when there was obvious inefficiency. However, increasing co-ordination was the present trend almost everywhere, largely because Government research (and the related control of documentation) had become so large a proportion of the total effort in most countries.

Mr B. C. Vickery (National Lending Library for Science and Technology) agreed that exponential growth of information literature was not a new problem, but thought the situation worsened because, relative to each searcher, the mass of material through which he must search grew greater. Moreover, more people wanted information; they were relatively less skilled at seeking it, and needed more aid. He was doubtful of all proposals to ease the information problem by restricting publication. If the technical possibilities of publishing existed, they would be used. There might indeed be a value in multiple publication, since different media might reach different audiences. Once information had been published, it would be disseminated, and would be cited and asked for by potential users. Consequently, it was up to documentalists to bring all documentary material under bibliographic control. To refuse to admit semi-published reports to the permanent bibliographic record would not abolish them.

Dr Coblans commented that the need to control publication was not new. It had long been the aim of responsible editors and their referees to publish only those papers that were good, that contributed to the progress of their science. In the post-war years there had been a marked consensus of opinion expressed by editors and scientific societies that more control must be applied to primary publication. He agreed that documents of all forms must be brought under some sort of bibliographical control; but the quality of the control must be suited to the bibliographical nature of the material, hence his division into 'public' and 'private' responsibility. The highly specialized documentation centre dealing exhaustively with a narrow field should devote as much effort as it could afford to gather in every scrap of 'paper' which might have some relevant information. To his mind there was no justification for the permanent bibliographical record to be cluttered up with such ephemera.

Mr A. H. Holloway (Admiralty Centre for Scientific Information and Liaison) said that, while agreeing with Dr Coblans that birth control of scientific publication was desirable, he considered that the first criteron should be the substance of the proposed publications and the elimination of those which contained nothing essentially novel; a second stage, which was admittedly very much different, would be the evaluation of likely survival value. On the other hand it seemed to him to be indefensible to condemn an entire type of document—the unpublished report—because it was bibliographically inconvenient, irrespective of its content. The essence of many of these reports never got openly published and much that was published tarried so long in the process that its value was much diminished.

Dr Coblans thought that all would agree with Mr Holloway that what was new and valuable should be published as quickly as possible. It was true that far too much important information relevant to the public interest still lay hidden away in obscure or classified and restricted documents. But the 'unpublished report' which had not passed through proper editorial selection, and which was not really available as the edition was small and the distribution limited, was the worst possible remedy. The working scientists, the administrators of research institutes, and documentalists must ensure that this material should be made public but in forms of publication that were truly available.

Mr J. Farradane (Northampton College of Advanced Technology) felt that the information problem did not lie solely in the flood of report material, important though that was in rapidly growing fields; it might also lie in commercial scientific publishing, which arose because scientific societies could not cope. He had suggested mild controls in 1938, but had been laughed at; with reason, because of the impossibility of deciding who would be accepted as controller of what. The problem, as Mr Vickery had said, was one of proportion, too much literature in one field for one man to digest or for one journal to abstract. Perhaps a number of specialist abstracts in much more specialized fields would be the answer. Information was not only a matter of data but also a matter of varied interconnections between things, of processes and ideas. Thus what the Americans called 'soft' information could not yet be handled adequately in computers. If financial support were available, adequate information centres, staffed with information scientists, could easily be established. The Americans were behind the times in their appreciation of these possibilities.

Mr Keith D. Staite (British Scientific Instrument Research Association) said that quite recently the Special Libraries Association had published a *Dictionary of report series codes* which listed a very large number of codes of reports published in the United States and the United Kingdom. There were two sections—one listing known codes, and another listing unknown or ambiguous codes. It seemed incredible that such a situation had been allowed to come about and it was surely necessary for the responsible organizations to rationalize their bibliographical control over the documents that were published under their name. The point he would like to put to the speaker was whether or not he would advocate central control over the publication of such documents and what he would suggest could be done to improve the present situation.

Dr Coblans replied that Mr Staite had drawn attention to a problem which was the daily burden of all who tried to catalogue reports which are issued by all sorts of organizations and given code designations to suit every individualistic whim. Big organizations, such as the national atomic energy authorities, at best had proper central control of the numbering systems, but even then documents with the most confusing and deplorable 'numbers' were distributed by them and led to much bibliographical frustration. However, once one accepted any document—however irresponsibly drawn up from this point of view—as a 'publication', one must reckon with the incredible situation bewailed by Mr Staite. Clearly there must be central control, in a bibliographical sense, of all official documents issued by an organization. Also managements should be gradually brought to the realization that publication had its own expertise and documentalists should be drawn in to supervise this sort of work.

Dr D. J. Campbell (Pressed Steel Company Ltd) felt that Dr Coblans' thesis had been attacked on rather inadequate grounds. Mr Vickery, for example, had defended two- or threefold publication of a paper because it would thus be seen by more people. Clearly, if published ten or twenty times over it would be seen by more people still. The answer, surely, was in better abstracting and information services so that the specialist would learn of the paper if it was only published once, rather than in clogging journals with rehashes of the same material.

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Aslib Proceedings

CALCUTTA UNIVERSITY CENTRAL LIBRARY

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THIRTY-SEVENTH ANNUAL CONFERENCE

Information Retrieval: a Revolt against Conventional Systems?

J. MILLS

Research on Users' Needs: Where is it Getting Us?

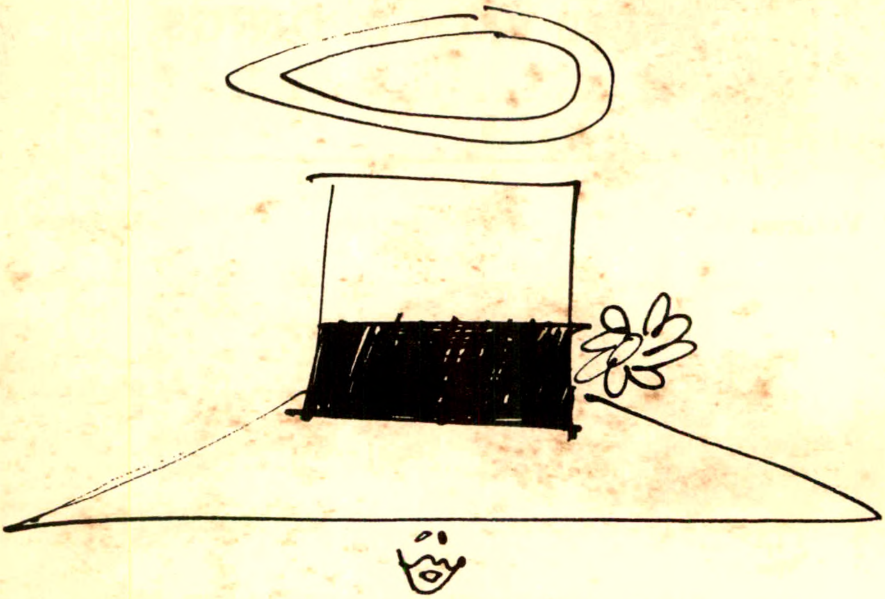
C. W. HANSON

The Present State of Research into the Communication of Information

B. C. VICKERY

ASLIB · 3 BELGRAVE SQUARE · LONDON SW1

Aslib Proc. vol.16 no.2 p.39-98 London, February 1964



our favourite saint

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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 February 1964 Number 2

ASLIB CALENDAR 1964

February

THUR.20. Evening meeting at Aslib, 5 for 5.30 p.m. Dr T. C. Barker on business records for the future.

FRI.21. Biological Group annual general meeting at Aslib, 3 p.m.

TUE.25 – FRI.28. Repeat of junior introductory course to special library and information work.

WED.26. Economics Group visit to Telex Auto Exchange.

March

MON.2 – WED.4. Repeat of course on information from the Press.

WED.4. Midlands Branch annual general meeting, Birmingham.

WED.4. Economics Group visit to Goldsmiths' Hall.

MON.9 – WED.11. Course on indexes for books and periodicals. See paragraph below.

WED.11. Chemical Group visit to Metal Box Co. Ltd.

FRI.20. Scottish Branch annual general meeting and one-day conference, Glasgow. See paragraph below.

WED.25. Evening meeting at Aslib, 5 for 5.30 p.m. 'The new BUCOP', by K. I. Porter. See paragraph below.

April

WED.8. Conference on feature card indexing. See paragraph below.

THUR.9 – SAT.11. Aeronautical Group and Chemical Group joint annual conference at Cranfield. See paragraph below.

FRI.17 – SUN.19. Midlands Branch conference at Oxford, 'Educating the user'. See paragraph below.

WED.22. Evening meeting at Aslib, 5 for 5.30 p.m. 'Education for librarianship', by J. Bird, Education Officer, Aslib.

May

SAT.23 – SUN.24. Engineering Group conference at Leamington Spa. See paragraph below.

June

FRI.5 – SUN.7. Electronics Group annual conference at Ashridge College.

Dr Richard Offor

The death has been announced, on 7th January, of Dr Richard Offor, O.B.E. Dr Offor, who was eighty-one, was Librarian of the Brotherton Library, University of Leeds, from 1919 to 1947. There he was responsible for organizing and widening the collections, planning the new building, and for training staff. Shortly after his retirement he became, and remained for thirteen years, library adviser to the Inter-University Council for Higher Education Overseas. In this work he was a deeply valued friend and counsellor to many engaged in the building up of new university and college libraries throughout the Commonwealth.

Members may remember his interesting lecture to Aslib in April 1954 on 'The development of university libraries in British overseas territories' (*Aslib Proceedings,* vol. 6, no. 3, August 1954, p. 151–8).

Mr T.M. Herbert

Members will be sorry to learn of the death of Mr T. M. Herbert, formerly Director of Research with the British Transport Commission. Mr Herbert was the Hon. Secretary of Aslib in its critical years following the war and was one of the principal Officers concerned with the successful negotiations for the first quinquennial grant. He was a signatory to the revised Memorandum of Association of Aslib in 1949. He showed a tireless interest in all the activities of Aslib and only retired when he was fairly confident in Aslib's financial future.

Aslib Evening Meeting

'The new BUCOP: the problems of the documentation of serial publications' is the subject of the evening meeting to be held on Wednesday 25th March. The speaker will be Mr K. I. Porter, editor of BUCOP, and the chair will be taken by Dr C. B. Oldman, C.B., C.V.O., F.S.A., formerly Principal Keeper, Department of Printed Books at the British Museum.

Mr Porter will discuss both the *British union catalogue of periodicals* and the *World list of scientific periodicals.* These are the major existing national listings of serial holdings in British libraries, but there are many other union lists, existing or planned, which represent the holdings of particular areas or of certain types of library. The *World list,* after its fourth edition, will be merged with the new BUCOP, which is to be issued as cumulative quarterly parts by means of punched cards. Mr Porter will consider whether the new publication can lead to the centralization and standardization of serial documentation in this country which at present is undertaken by so many different hands. Separate interests can be cared for, up to a point, in the coding of the punched cards; but separatist tendencies in the compilation of union lists would not appear to be in the interests of efficiency and comprehensive coverage.

The meeting will be held at 3 Belgrave Square at 5.30 p.m. Tea will be served at 5 p.m.

'A New Look at Feature Card Indexing'

After the Aslib Conference on Co-ordinate Indexing held in March 1963, a need was expressed for more information on the practical aspects of the subject. A conference has now been planned for 8th April 1964 at which it is intended to avoid mere repetition of what has already been published, to disseminate practical 'know-how', and to show the simple practical means which have recently been developed for applying the known principles of feature card indexing to actual collections. It is hoped to give participants tabular summaries of the various systems discussed, and speakers will be invited to present their facts in a set pattern to make comparison of the different techniques easier.

The chair will be taken by Dr W. E. Batten, Head of the Central Technical Information Unit of Imperial Chemical Industries Ltd. The speakers, collectively, will have had personal experience with the mechanical forms in use and the range and scale of the material will be as diverse as possible—from research records to commercial data.

The conference will be held at the London School of Pharmacy, Brunswick Square, WC1. The fee will be 3 guineas including luncheon, coffee, tea, and some preprinted data. Full programmes and application forms are being distributed with this issue of *Aslib Proceedings*. Accommodation will be limited to 220 persons and prompt application is advised. Additional copies of the programme and form may be obtained from the Meetings Organizer, Aslib, 3 Belgrave Square, London SW1.

Course on Indexes for Books and Periodicals

A good index is an essential part of any book containing information worth preserving, and is possibly an even more important feature in a serious periodical. Yet all too often the index is neglected and its work given to people with little or no training in or experience of indexing, with the result that indexes are frequently of poor quality. This is partly due to the lack of training facilities in indexing.

To help remedy this, Aslib, at the request of the Society of Indexers, is to hold a short course on 'Indexes for books and periodicals'. Instruction will be given in the theoretical basis of indexing, and in many of the practical problems that arise, including the preparation of indexes for the printer. Special attention will be given to the production of cumulative indexes, and students will have an opportunity during the course to do some practical work.

The course will be held at 3 Belgrave Square, London SW1, from Monday 9th to Wednesday 11th March. The fee will be 6 guineas to members of Aslib or of the Society of Indexers, and 8 guineas to others. A programme and application form are enclosed with this issue.

Midlands Branch

A week-end residential conference is being arranged by the Branch on the general theme of 'Educating the user'. It will be held at Hertford College, Oxford, from Friday evening 17th April to lunchtime on Sunday 19th April. The programme will include papers and discussions, and visits to places and libraries of interest. Any members outside the Midlands Branch area who would like to receive details should write to the Hon. Secretary, Mr J. H. Seals, the Library, College of Advanced Technology, Gosta Green, Birmingham 4.

Scottish Branch

It has been the custom to hold the one-day conference and Annual General Business Meeting in February, but this year members and friends are asked to note that it will be held on Friday 20th March. It is the turn of the West of Scotland to house the meeting, which will be in the Burlington Rooms, Bath Street, Glasgow. The theme will be 'Library publications' and the principal speakers Mr K. Boodson, Librarian, Imperial Metal Industries Ltd, and Mr S. B. Page, Assistant County Technical Librarian, Hertfordshire. The film 'At your request' on the work of the National Lending Library at Boston Spa will be screened.

Full particulars may be had from the Hon. Secretary of the Branch, Mr Wm. H. Rutherford, Royal Society of Edinburgh, 22 George Street, Edinburgh 2.

Aeronautical Group and Chemical Group

The Annual General Meetings of these Groups will be held on Thursday 9th April during the Joint Conference at the College of Aeronautics, Cranfield. The Chemical Group AGM will be from 7 to 7.30 p.m. and that of the Aeronautical Group from 7.30 to 8 p.m. Nominations for the Aeronautical Group Committee, proposed and seconded by two members of the Aeronautical Group, will be welcome, and should be sent to the Hon. Secretary, Miss M. Dyke, Librarian, Royal Aircraft Establishment, Bedford, to reach her not later than 23rd March.

As Mr C. W. Cleverdon will be on a visit to the United States for a few weeks before the conference, all inquiries about the conference should be addressed to the Hon. Treasurer of the Aeronautical Group, Mr J. S. Rosser, at 48 Chaworth Road, Ottershaw, Chertsey, Surrey.

During his visit Mr Cleverdon will be taking part in the next Rutgers Seminar, on alphabetic subject indexing, as a member of the panel.

Engineering Group

The Engineering Group is to hold a conference at the Manor House Hotel, Leamington Spa, from Saturday 23rd to Sunday 24th May. The general theme of the conference is 'Iron and steel'—the two major materials of the engineering industry—and a full programme has been arranged.

This will be the first conference to be held by the Group and it is hoped that members will make the most of the opportunity to meet each other. There are a number of Aslib members with engineering interests, especially in the Midlands and the North, who are not members of the Group, and they are particularly invited to attend the conference, which will include the Group's Annual General Meeting. A programme and application form are enclosed with this issue of *Aslib Proceedings*.

Retirement of Ben Fullman

Benjamin Fullman, M.B.E., B.SC., F.R.I.C., F.I.M., has just retired from the post of Chief Information Officer of the British Non-Ferrous Metals Research Association after thirty-three years of service with the BNF.

Mr Fullman was one of the pioneers of technical information services in the United Kingdom, and the Information Department of the BNF was one of the first technical information units to be established. Under his leadership it has earned a high reputation and is well known both here and abroad.

Mr Fullman played an active part in the affairs of Aslib over a long period. By the mid-'thirties he had presented three papers to its annual conferences. He was a member of its Council from 1946 to 1953, and at various times a member of several standing committees, and Chairman of the Education Committee.

He is well known personally to most of the older Aslib members, and by repute to many of the younger ones. All will wish him a happy and fruitful retirement.

In a personal tribute to Mr Fullman, one of his contemporaries writes:

'Everyone who works, or has worked, in a technical information service owes something to Ben Fullman, including those who do not know him and perhaps have never even heard of him. It was Fullman, more than any other single man, who, through his work for the BNF, provided the first convincing practical evidence that technical information officers and technical information departments could serve a useful purpose in industry. Over thirty years ago he and a few other pioneers were already running good technical information services, and it was largely because of them that industry came to realize that such services were worth while. Almost inevitably Fullman himself and his department were regarded as prototypes; and in the 'thirties and 'forties there were few people who, when charged with starting a technical information service, did not seek advice from Fullman and try to model their departments largely on his.

To model themselves upon him was more difficult, because some of the qualities which make him an outstandingly good information man are essentially personal. To my mind his greatest gift, and one very difficult for others to acquire by experience and training, is his ability to visualize instantly, sometimes much better than an inquirer himself, exactly what kind of answer the inquirer will find most useful. To his wide technical knowledge and his mastery of sources of information Fullman adds a kind of inspired technical common sense, which shows in every aspect of his work, and most of all in inquiry work.

He is wonderful on the telephone. During the war, when I was working for a firm in Wales which was a member of the BNF, I used to telephone Fullman for help on knotty problems. A trunk call was no light matter at that time—it needed Government priority even to book a call—and every minute was precious. I still remember with gratitude and amazement what Fullman could do in three minutes. Having put my question as best I could I would hear him over the phone as he barked to his staff in his harsh, endearing voice. Within seconds, as they arrived with data and documents, he would start replying, telling me exactly what I wanted to know, how best to use the information, warning me of its limitations, telling me precisely what else he intended to do to help—and he always kept his promises. If ever there was a satisfied customer, I was one. That was nearly a quarter of a century ago. From recent calls to Fullman I know that he has not changed: the same eager desire to help, the same quick grasp of what is wanted, the same exact matching of answer to inquiry.

Of course there were others besides Fullman who blazed the trail in the early days: Agard Evans, Ashworth, Freeman Horn, Withers are some of the names that spring to mind; but I am sure that they would have agreed that none excelled Fullman as a personal practitioner of the art and science of providing technical information.

He was fortunate in the backing he received early on when information services were very much on trial. R. S. Hutton, then his director, was and still is a vigorous exponent of the importance of technical information. It was significant that both he and A. F. Ridley, the BNF's first librarian, were present at the conference that led to the foundation of Aslib in 1924. But the BNF's pioneering work in the information field would have been far less effective as an example to the rest of us if Fullman had not been so good at his job; and Aslib in its early days would have been the poorer if it had not been able to point to the Information Department of the BNF under Fullman as a working example of how good a technical information service could be.'

Information Training Grant

The University of Illinois has received a three-year grant of $46,460 from the National Science Foundation, for a new programme to train science information specialists. Initially, the subject areas will be biology and chemistry and the programme will lead to a master's degree. Students will be trained in science and librarianship, acquainted with communications skills and use of computers, and will be given experience in working with scientists and their information problems. Further details may be obtained from the Graduate School of Library Science, University of Illinois, Urbana, Illinois, USA.

Statistical Association Methods Symposium

The US National Bureau of Standards and the American Documentation Institute are sponsoring a 'Symposium on statistical association methods for mechanized documentation', to be held in Washington from 17th to 19th March. Topics will include statistical association methods and citation indexing, and automatic classification and categorization. Information about the symposium may be requested from Miss Mary Elizabeth Stevens, National Bureau of Standards, Washington DC, USA.

Course for Management

The next in a series arranged by Management Courses Limited will be a one-day course at the Midland Hotel, Manchester, on Wednesday 26th February. It is entitled 'Top data for top men: what the managing director needs to know', and will be presented by Dr James M. S. Risk, a director of Management Courses Limited, and formerly financial controller, The Brush Group. The fee will be 12 guineas. Full details may be had from Management Courses Limited, Albany Courtyard, Piccadilly, London W1 (telephone Regent 2211).

Air Pollution Inquiry

Mr Allan R. Smith, formerly head of the economics and statistics department of Imperial Chemical Industries Ltd, has been appointed by the Society of Chemical Industry to make an economic and technological inquiry into air pollution. Mr Smith will try in particular to assess the economic costs to the nation of ill-health and of corrosion of materials attributable to air pollution. The work will take about two years. Mr Smith has been a member of Aslib Council and has helped Aslib on several occasions by lecturing at meetings.

Directory of Special Collections on Africa

The Standing Conference on Library Materials on Africa has issued *The SCOLMA directory of libraries and special collections on Africa.* This directory covers over 120 libraries in the British Isles which have collections of material on Africa. Some of the important collections are very fully annotated and many libraries with quite small collections are included. The directory is edited by Mr R. L. Collison and is obtainable from Messrs W. Heffer & Sons Ltd, 3 Petty Cury, Cambridge, price 15*s* plus 1*s* 3*d* postage.

Courses in Information Science

Mr A. Gordon Foster, F.I.INF.SC., has now joined Northampton College of Advanced Technology, London, as Second Senior Lecturer for the courses in information science (Department of Management and Social Sciences). The first full-time one-year course is now proceeding very satisfactorily. Applications for the full-time course for 1964–5, starting in October, can now be accepted by the College. The two-year evening course is also being continued and a new series will start in October. Inquiries should be sent to the Secretary, Northampton College, at St John Street, London EC1.

Institute of Information Scientists

The Council of the Institute of Information Scientists has been considering the desirability of holding occasional Ordinary Meetings in the provinces, and the first of these will take place in Manchester on Wednesday 25th March. It will be held at the Associated Electrical Industries Research Laboratory, at Trafford Park, from 2.30 p.m. to 6.30 p.m. The programme will include a paper by Mr T. N. Shaw, of the Unilever Research Laboratory, Port Sunlight, on 'Some machine-oriented indexes and information systems'.

Numbers for the meeting are limited to thirty. Members of Aslib who are not members of the Institute but would like to attend, should there be any spare places, are invited to inquire from the Hon. Secretary, Mr J. E. L. Farradane, Torran, Crofton Road, Orpington, Kent.

British Museum Reading Room

The Reading Room of the British Museum was re-opened on 3rd February, after being closed for repair and redecoration since October. The Reading

Room and the North Library and the State Paper Room, which are open until 9 p.m. on Tuesdays and Thursdays, are to remain open until 9 on Wednesdays also (as from 5th February).

NEW MEMBERS

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United Dominions Trust Ltd	London	P. L. Money
University of Adelaide	South Australia	Librarian
Wessex Regional Hospital Board	Winchester	B. Donald
West Ham College of Further Education	London	D. E. Job
Wigan & District Mining & Technical College	Lancashire	K. B. Swallow

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Frankel, Miss Joan	USA
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McKenzie, W.	Stevenage
Napier, Miss Elspeth	Maidstone
Nuyl, Th. W. te	Holland
Savage, G. P.	Sheffield
Stevens-Wilson, L. W.	Enfield

ASLIB 37th ANNUAL CONFERENCE

University of St Andrews, 24th—26th September 1963

(Continued)

The final papers presented at the 37th Annual Conference, by Mr J. Mills, Mr C. W. Hanson and Mr B. C. Vickery, are given below. The first two papers, by Mr B. C. Brookes and Dr Herbert Coblans, were published in the January issue of *Aslib Proceedings.*

INFORMATION RETRIEVAL: A REVOLT AGAINST CONVENTIONAL SYSTEMS?

J. MILLS, F.L.A.
Deputy Director, Aslib Cranfield Research Project

Chairman, L. J. Anthony, F.L.A., Librarian and Head of Documentation Services, UKAEA Culham Laboratory

LIBRARIANSHIP and documentation is a service industry. Its end product is the receipt by a customer of the information retrieved for him, from a store, by the librarian, whether this service is effected indirectly (by the mere placing of the item in some convenient spot in the library, the customer helping himself) or by direct provision of a reference to a document or the document itself. So our continuing preoccupation with IR is natural enough.

In assessing any part of the processes by which we implement our job of making information accessible it is necessary to view them as a whole—as a complete system (and an incidental benefit of the work now being done on mechanizing IR is its healthy influence in promoting a systems approach). The essential processes are: to acquire and gather the information-bearing records; to index them—that is, to label them against the day when we hope to pull them out as an answer to some inquiry; to store them as economically and as conveniently as possible; to search them when we receive a request and, we hope, to retrieve those most relevant to the request. Without in any way underestimating the importance of the other stages in the process (acquisition, reproduction, etc.) we can admit that the ultimate objective is the prompt retrieval of the information we store, when it is needed. Anything we do which impedes retrieval, from sitting on a document (waiting for the perfect classification number) to giving it the wrong label (and losing it for ever), negates our purpose.

At the heart of the IR problem is indexing and searching. Both deal, fundamentally, with the same problem—i.e., how to analyse conceptually and describe a piece of information (in a document, in a question) in a consistent manner so that fruitful matches are likely. But a world of subtle differences waits to obscure this matching when, in the one process, we try to anticipate our decisions in the other. It is likely that the effectiveness of an index depends as much on the searching as on the indexing.

The aim of indexing is to reduce the amount of text we need to scan when looking for relevant information. It is essentially a process of classification. To reduce a 5,000-word report to the statements 'this document belongs to the class of documents dealing with the *determination of cobalt impurities—in nickel—for electron tubes*', and similarly to reduce all our other documents, means that a search for information on a number of topics, from *Nickel for electron tubes,* to *Cobalt determination,* is enormously speeded up. For we know what we can ignore.

In searching we try to predict how documents might be labelled *if* they contribute to the answering of the question. It follows from this that we cannot know too much about the connections between subjects if we are to succeed. If the question is on the *aerodynamic heating of re-entry vehicles* we should know that the answer may be in a document indexed as being about a *blunt nosed body of revolution.* The implication here is that *somewhere* in our system we should have a really thorough map or classification of the subject field, whether or not this is physically embodied in the file-arrangement of entries.

The last few years have seen the beginning, long overdue, of attempts to measure some significant features of IR on a scale large enough to allow reasonably firm conclusions to be drawn. Historically the literature on IR, from the work of Dewey onwards, has shown a preoccupation with contending systems of classification, of subject cataloguing, and more recently of systems based on particular types of equipment. Much of the time such systems have been regarded as self-sufficient, complete alternatives to each other. Only recently have we come to see clearly what a mixture of devices such systems represent and just how much they have in common.

Fewer are now guilty of such confusion as is implied by references to 'a choice between UDC and punched cards'. But many are still confused by the interaction of indexing devices and the physical means of implementing these, and assessments of the significance of 'non-conventional' systems of IR are often bedevilled by this confusion. So it seems appropriate to restate first some fundamentals of indexing and searching which are unaffected by the adoption of any particular system, intellectual or physical.

The purpose of indexing is to tell us what we can afford to ignore. A needle in a haystack is soon found if the exact cubic foot containing it can be predicted. The danger, we all know, is that we may ignore too much, being overconfident as to the contents of our classes. We tend to assume that the precise configurations of our indexing descriptions will occur exactly in the questions asked of us. But they never do! A recent report from Arthur D. Little, Inc.[1] gives a simple demonstration of one way in which relevant documents may be overlooked; as a result of overlaps in near synonyms, a four-term question could be looked for in 810 different ways. The numerous ways in which documents may be missed have tended to be underestimated in the search for a perfect system. We have often assumed that by perfecting the network of associations between subjects we could improve recall (i.e., retrieving a higher percentage of the documents relevant to a request) without loss of relevance (i.e., without retrieving at the same time more irrelevant documents). Or, conversely, that class descriptions could be endlessly refined to give closer and closer matches with our questions (i.e., higher relevance), yet without losing anything by overlooking relevant material.

These assumptions are almost certainly false. The scatter of information in the literature means that however carefully we frame our questions we will retrieve extraneous material. And if we try to keep the latter out we will do so only at the expense of excluding some relevant material also. When we look for document descriptions to match our search prescriptions we find that their attributes are annoyingly mixed. In this they resemble the matching of human beings with any given set of criteria, as when the several candidates for a job each meet a different mixture of the requirements but none meet all of them.

A major achievement of the Aslib–Cranfield investigations so far has been the production of concrete figures attaching values to these parameters which are likely to be typical for collections in the field of science and technology. A collection might operate, for example, at an average level of 80 per cent recall with 30 per cent relevance. Obviously the worth of such figures will be affected by the reliability of the methods used to establish relevance, and these undoubtedly need much more testing. But it is very likely indeed that we have here an approximation to the truth.

It needs to be emphasized that such figures relate to documentary information and not to data retrieval. Data in this sense consist of discrete facts which, from the point of view of retrieval, constitute mutually exclusive classes. This is something which documentary classes can never hope to do.

Does this imply that we might as well abandon attempts to put precise labels on our documents, since the price of high relevance is loss of documents? We need to remember here the symbiosis between indexing and searching. If we index closely we may find exactly what is wanted at the first search; and if we don't find it first time we can automatically lower our sights by widening the search. This is a fairly elementary truth—that if we want precision in locating material it must be built into the index, but if this should threaten to lose us other relevant material we can abandon it at the search stage. Since the second edition of Dewey, eighty years ago, this has been the underlying assumption in favour of closer classification and indexing. Now, Cranfield has given reasonably precise figures to prove it—and it did seem to need proving. Also, what is more important, Cleverdon has added a coherent theoretical analysis of just what factors are involved. Using his terms, two factors are crucial. Firstly, the specificity of the indexing—the degree to which we recognize the precise species involved in a concept rather than a containing genus, e.g., *cone* rather than *body of revolution*. Secondly, the exhaustivity of the indexing—the degree to which we recognize the different categories of concepts in a subject description, e.g., to index a document as *transpiration-cooling* rather than *theory—effects—upstream transpiration cooling—heat transfer—skin friction characteristics—compressible laminar boundary layer*.

The more specific our indexing the better the relevance ratio we can attain. The more exhaustive our indexing the higher the recall. True, high recall can be achieved by making our searching broader. But there are obvious limits to the lengths to which we can go here and to the number of documents or references we are prepared to examine to find what we want. If a report whose general theme is the *lift and drag of glide configurations* contains an account of an unusual *free-flight shock tube experiment* the latter information is unlikely to be found when wanted unless the indexer includes it in the indexing. For it *could* be in any of a thousand reports.

The necessary vehicle of exhaustive and specific indexing is an exhaustive vocabulary. Restrict the size of this, and the facilities for high recall with relatively high relevance are impaired. The librarian, aware of this, should judge the degree of exhaustivity and specificity of indexing he can afford in terms of the balance of costs involved: on the one hand the constant and high cost of indexing, on the other the high cost of searching broadly for precise items together with the danger of not finding relevant material. Of course, the size of collection is an important factor in deciding policy here. A 25 per cent relevance ratio may be acceptable in one system and quite unacceptable in a much larger one.

It follows that we need to be aware of how we can control the recall/relevance ratio. This ratio is a function of the size and nature (reflecting the principles on which they were established) of the classes we examine in response to questions. Control is exercised by a fairly small number of indexing devices, some of which are designed to broaden the class definitions (and so improve recall) and some which narrow our classes (and so improve relevance).

For example, in searching for a topic x we can enlarge the class by examining all the synonyms of x, or all the different word forms of x, or its containing genera. Or we can narrow the class by looking only for x combined with some qualifying concept, e.g., x co-ordinated with another term, x with a role indicator, x with a particular weighting, or a linking device. The degree to which an index system allows this sort of control determines the range of its performance. A system designed to facilitate the use of only one or two control devices cannot expect to enjoy the range of one using more. For example, a uniterm system in which the primary device is the extremely powerful narrowing device of co-ordination, the impact of which is softened only by the control of synonyms (as a broadening device) will need to be cautious in the degree of co-ordination, and consequently suffer relatively low relevance if it is not to lose many relevant documents.

On the other hand UDC, in which precise pre-co-ordination, represented by UDC numbers, is tending to reduce recall (by narrowing classes) has built into it the expanding device of hierarchical linkage and synonym control, via the A/Z index, to counter it. Again, in fully faceted classifications the assignment of terms to strict categories is a form of role-indicator. This is a decidedly restrictive device and may need to be countered by recall-boosting devices. One is to hand in that each category or facet is arranged hierarchically, but further class enlargement—by observing the variant word forms in the A/Z index (e.g., conduct, conduction, conductivity) and examining these—provides a further measure of control.

It is worth noting that all recall-boosting devices can be applied at the search stage. For example, a uniterm system could pursue hierarchical searches *à la* UDC, using UDC to programme them. It would be much less convenient a way of doing it, of course; but the advantages of post-co-ordination might be thought to outweigh this.

Once we recognize that the classes through which we channel our searches are determined entirely by a limited number of class-broadening or class-narrowing devices, we can see that any indexing 'system' is an amalgam of some or, just possibly, all of those devices. This should not lead us to regard development and improvement of these systems as unimportant. The Cranfield investigations have suggested in the very detailed analysis of their failures to recall known relevant documents, that systems *per se* are relatively unimportant. By this we mean that if, for example, a document has been exhaustively and specifically indexed as dealing (amongst other things) with *bang-bang*, then it will be found, whether indexed by simple terms in a uniterm system, as a subject heading in an alphabetical catalogue, or put tidily with other types of spoiler operation under aircraft controls in some classification. Moreover, a generic search, say, for other kinds of spoiler control can be equally successful. That is, given a determined indexer and a determined searcher, a poorly structured index can still produce as high a proportion of relevant documents as a good one. Failures to find relevant documents can seldom be traced to failings in the system as such. Human error, inadequate indexing and inadequate searching are much more potent. But the greater convenience of some systems in some circumstances remains to be a matter of considerable concern. A system of great consistency and predictability is likely to be easier and faster to use than others. Where any degree of self-service prevails as a method of using a system then the convenience of presentation is a crucial factor. Add this consideration to the fact that new libraries are springing up at an increasing rate throughout the world, not merely in undeveloped countries but at different levels in this country, as for example in its schools and its industries; also, that national subject bibliographies are developing and that wide use of them implies a control which is largely independent of the vagaries of language—and we have a number of excellent reasons why we should continue to examine and improve and further test indexing systems.

I have tried to indicate some fundamental and invariable conditions within which we have to operate in IR. These are completely independent of the physical aids we may use to implement our indexing and searching and without a full awareness of them consideration of these physical aids can be utterly abortive. In summary, these conditions are: the cost of high recall is either exhaustive indexing or very exhaustive and exhausting search. The cost of high relevance is that we must index more specifically (nothing we can do at the search stage will compensate for deficiencies here) and that we must accept a certain loss of relevant material; but we always have to hand a safety hatch in that we can recover this lost material by broadening our search. We know that some index devices will broaden our classes, others will narrow them. It is up to us to try to make and use our indexes so as to get an acceptable recall-relevance ratio. There are certain steps we can take which will affect the ratio tolerable to a given collection—e.g., how we present the final material to the questioner. To present him with a handful of easily scanned photocopies of articles rather than a set of references to be pursued through many different document files will clearly alter his judgement of what is an acceptable relevance ratio. Such steps are not in themselves indexing steps, but are nevertheless of importance in formulating indexing policy.

When we come to consider the possibilities offered to IR by the development of non-conventional systems and mechanized aids it seems reasonable to marshal first of all the weaknesses of conventional systems as such. The central distinction seems to be, in the first place, between pre-co-ordinate and post-co-ordinate systems. Our conventional systems reckon to select at the indexing stage the conjunctions of terms which are most likely to anticipate the sort of request the system tries to answer. This 'pre-co-ordination' may take the form, for example, of several different subject headings in an alphabetical catalogue or a series of UDC numbers which are then permuted (giving two stages of pre-co-ordination—that implicit in the enumerated UDC number as when 669.183.2 represents the co-ordination of Technology—Metals—Production—Steel—Furnace—Reverberatory—Processes—Open-hearth—Siemens-Martin, plus further co-ordination by coloning with other numbers). The great weakness here is the limitations it places on the access given to the searcher. The indexer is bound to select a few prominent features and relegate others to the status of 'distributed relatives'. For example, the literature of aerodynamics refers equally and continually to kinds of aircraft, their parts, shapes, dimensions, materials, aerodynamic behaviour, and to aerodynamic phenomena, types of flow, speed, and so on. A limited number of these only can be taken consistently as the leading element in some fixed entry. Theoretically a partial solution is multiple-entry, providing for as many alternative approaches to the information as is economically feasible in the circumstances. But if we did try to index really exhaustively this would rapidly produce, in our card catalogues, an often embarrassing physical bulk, raising in turn the problems of physical accommodation and of maintenance.

This physical limitation on the exhaustivity of indexing which is feasible in conventional systems is exacerbated by such impediments to the indexing process proper as the slowness with which standard vocabularies are revised, updated and published, whether this be UDC or subject heading lists. But it needs to be stressed that the rapid incorporation of developing information is a continuing problem for all IR systems and is not peculiar to conventional ones; also, that the development of strict and predictable rules for the analysis and extension of existing classes as seen in such devices as verbal extensions in a classified catalogue (e.g., in the *British National Bibliography*) and an explicit citation order in subject headings (e.g., *British Technology Index*) have considerably eased this problem for modern conventional catalogues.

Limitations on access are primarily limitations on recall. It is probably a measure of our success in the matter of relevance that most librarians using conventional systems are confident of being able to produce the best documents in response to a request although this is only a selection of their total resources in the area concerned.

However, the popularity in certain conditions of post-co-ordinate systems is probably due to the fact that they offer a means of extending recall and this they do in two ways: firstly, they provide more access points; any term used in the indexing of a document is as convenient as any other as a lead-in to the system—the co-ordinations are made by the searcher, *after* the indexing stage, as and when they seem desirable. Secondly, they reduce the physical size of the index.

These advantages were first seen in the use of edge-punched cards. But the obvious limits on the size of a collection in which these are feasible (ten thousand is probably the extreme limit, and most librarians would reckon this much too high) have restricted the growth of this as an alternative system. The development of centre (machine) punched-cards took away the agony of successive small searches, which is endemic to edge-punched cards, and added the important advantage of providing print-out facilities. But searching by this device was and still is crude compared with the speed and subtlety of human searching of ordered pre-co-ordinate files. The need to duplicate sections of the file in order to reduce the time spent in sequentially scanning the whole of a large file has always threatened to offset the economy in physical size which the system offers in principle.

The punched-card systems above use 'item-entry'—i.e., the basic indexing unit is an entry bearing the subject descriptions of one document (item) rather than an entry bearing the document numbers of one subject-term (term-entry). Another kind of item-entry system is that using a photo-electric selecting device. The first of these—the well-known Rapid Selector—made a frontal attack on the problem of incorporating the record itself (in microform) with the index entry. Its successor (of a kind) is the Kodak Minicard, probably the most complete and most expensive IR system in existence (it costs $2,500,000). Filmorex is a very handy and much cheaper small version. But the search speeds of all these all compare unfavourably with that of a good human searcher using an ordered file.

One of the attractions of the term-entry systems which have become so popular since the war has been their provision of multiple access with even greater economies in the size of file since this is based on vocabulary size, not collection size. The earliest form of optical-coincident card appeared in 1915 and the principle was rediscovered by Batten and others in the 1940's. Whilst there is no doubt as to the superior ease of handling of this system compared with edge-punched cards, it has certain disadvantages compared with any item-entry system in that no information whatsoever about the documents is conveyed at the first search stage (except when used with the rare Microcite device).

Another form, Uniterm co-ordinate indexing, in which coincidence of document numbers is detected by visual sequential scanning, has proved very popular despite its clumsier method of operation involving formidable problems of posting and comparing. A prominent use of computers by librarians in the United States seems to be simply as a highly efficient way of keeping Uniterm lists posted and weeded.

Both Peek-a-boo and Uniterm are very attractive in some ways, particularly in apparently offering much simpler indexing than, say, UDC. They are certainly simpler at the input (indexing) step, but less convenient in output in that it is difficult to utilize conveniently certain very useful indexing devices, such as interfixing (links) and hierarchical linkage. There are also ways of making virtues of their limitations, as when Peek-a-boo files are wound up after a limited number of years and a new file begun, thus solving a number of problems, besides that of the limited number of positions available for punching holes. On the other hand, there is evidence that for a mixture of reasons some of the non-conventional systems meet a definite consumer-resistance. This may be no more serious than the initial resistance to the card catalogue on the part of people used to catalogues in book form. But it certainly exists.

By allowing much freer access, these post-co-ordinate systems tend to increase recall. But relevance, which is controlled by careful indexing input, has been relatively neglected in that control is almost entirely in terms of co-ordination which is a very powerful device for reducing classes, but not a very subtle one.

Two commentaries on the fundamental claim of post-co-ordination to provide superior access compared with conventional, pre-co-ordinate systems are worth noting. First, Jahoda's modest survey[2] in which he found that only in the case of chemical structures did the greater freedom of access prove decisively superior and enable searches to be made which would be impracticable by pre-co-ordination. Second, a fair amount of incidental evidence has been building up at Cranfield, in particular during the recent WRU test,[3] to suggest that a relatively modest degree of pre-co-ordination (up to eight or ten different entries, say, per item) brings the recall performance up to that of post-co-ordination.

The most spectacular challenger of conventional systems is, of course, the computer. The capabilities of these machines in the matter of recording data, of scanning it, and of printing out an answer are so far beyond anything existing before the war that they open up the possibilities, at least, of much more exhaustivity in the analysis and indexing of information—and hence much fuller recall. The basic mechanism is still the same as for other machines—the recognition of a match between a search prescription, or part of it, and a document description coded in the index, using post-co-ordination. The speed with which this can be done, however, is practically in a new dimension (the IBM 7090 can scan over sixty thousand characters *per second*). It is even becoming feasible now to simulate the original nightmare from which indexing afforded us a retreat—that is, to look at the whole text of our documents when searching.

However, it is important to distinguish this central facility (of extraordinarily rapid scanning) from other features of the computer, for it is not the whole story. Also, when considering the computerized systems as rivals of the conventional ones it is important to distinguish what is feasible here and now from what is being done experimentally. Much discussion of the subject has been bedevilled, largely by writers from the machine side, by a strong tendency to refer to future possibilities as though they were present facts. A great deal of work is being done on the application of computers to information work and some of the experimental work will be mentioned later. Here I shall consider only the use of computers as practical, working tools now, at the present time.

In any working IR system, the first job (1) is to examine the documents to decide what they are about. Then (2), a highly condensed description of them must be made, in the language of the system (e.g., UDC numbers, Uniterms). Thirdly, (3) these decisions must be physically incorporated in some index-file (to await searching) whilst (4) the documents themselves, or reproductions of them, are stored in another file. When a question is now asked of the system, its subject must first be grasped (5), then (6) translated into the language of the system, and (7) a search programme devised; a search is then made for matches (8). On making a match, the first stage of retrieval proper, the document numbers must be recorded (9) and the documents themselves then looked for. In a term-entry system a preliminary screening of the apparently relevant documents may occur here, since the title description, or abstract even, may be found at the same time as matching.

Of the above processes, no working computer system at the moment can perform 1, 2, 4, 5, 6 or 7. Process 3, the physical insertion of entries into the system, requires the translation of the data into machine-readable form (punched cards, punched paper tape) and is not cheap. Process 7 requires a further step of physically programming the machine itself before search is possible. This may take considerably longer than the 'intellectual' programming of the question. Process 8 is the step involving the marvellous speeds referred to. Even so, it is debatable whether any really significant improvement is effected here. A skilled librarian, searching a UDC file, say, can widen or narrow the search in many different ways, moving from one hierarchy to another, confounding word forms, etc., and do this at relatively high speed. An average search by a conventional file is a matter of minutes. Even when exhaustive search is made an hour, say, would usually suffice. It is true that a computer's search will be more exhaustive in that a much bigger slice of the total index file will be examined. But if the flexibility of search normal with a conventional file is to be emulated by computer the programming must be elaborate indeed.

In process 9, the computer is capable of extremely rapid printout of document numbers or descriptions. This can be used in order to produce printed catalogues, or bibliographies, which can be rapidly updated with relatively little additional work. In the above operations the size of the index file can be decidedly greater in the computer than it can conveniently be in a conventional card file—and much more compact.

The conclusion we draw from the above summary is that, for all the extensive published descriptions of ambitious machine based systems in the last decade, there is no suggestion that any have shown a spectacular or even marked improvement on any comparable conventional system. So far as indexing and searching go, there is little doubt that good 'manual' systems are still every bit as effective in the vast majority of cases—and very much cheaper.

As to economic efficiency, there is virtually a blanket of non-communication. For example, in the NSF handbook[4] describing a number of installations, mention of costs is sedulously avoided. The only certain thing is, to quote the author of a paper describing one system: 'It is very expensive!'[5] However, two points need stressing here. Firstly, hardly any library or information department buys or rents a computer for its sole use. In the great majority of cases it makes use of a computer which is already possessed by the parent organization and although some internal charge might be made for such services, the huge capital charges which may be entailed seldom, if ever, appear as an item in the library budget. None of us should complain on this score. Secondly, costs are certain to drop steadily, relative to performance. The expenses of key-punched input, for example, will be drastically reduced when an effective print-reading device is developed, as is almost certain to be the case in the next few years.

If we judge the progress of machines in IR as an uninspiring one so far, the reasons are fairly well known. Firstly, the initial neglect of known indexing skills, with the subsequent laborious rediscovery of such devices as hierarchical chains, of partitioning (links), of roles, etc. This is true not merely of computers but of all non-conventional systems, many of which are now introducing these devices to supplement their crude co-ordination.[6]

Secondly, the initial concentration on the selection stage (for some years the whole process was often referred to as MLS or MS—machine literature searching, or machine selection). The human search of an ordered file (i.e., of selected parts, or classes, of it) has always been faster than any machine scanning of the whole file. As a result the latter tactic fell into disrepute and ways of dividing the file (often accompanied by extensive duplication of sections of it) have been explored. But the astronomical speeds of the computer promise to give it a new lease of life.

Thirdly, the new rigidities of the machine system itself. Whereas the human searcher continually adjusts his search to what he is finding, this sort of feedback has been conspicuously absent in machine systems. Recently, however, elements of feedback are being provided in the form of a printout, at an early stage of the search, of an assessment (based on frequency of occurrence of words in the vocabulary) of the number of documents the programme being followed is likely to produce, so that adjustments can be made if necessary. Generally speaking, elaborate programming is needed if the heavy expense and delay of re-programming is to be avoided. All the possible paths to the information that it might be useful to explore must be thought of in advance. But this is no bad thing in itself; it forces the indexer-searcher to consider the full possibilities of the system—something which in conventional systems human fatigue and human error may prevent.

The failure of many elaborate and expensive mechanized systems to give quick replies to questions often shocks British librarians. This failure is usually the result of the system of batching searches and making them only when machine time is available—a few hours a week, perhaps, or overnight. However, it is possible that the need for such rapid service is not so widespread as we think. But by the same token, neither is the need for very exhaustive search, the provision of facilities for which is one of the advantages most often claimed for computer systems.

Fourthly, the fact that computers are rarely made or bought just for IR purposes has led to some questionable features in the present movement towards computerization. It has led to pressure being put on librarians to make *some* use of the computer, whether or not it is really justified. What has to be justified is the cost of the computer to the parent organization. The use of the computer is claimed to add to the prestige of the librarian 'progressive' enough to adopt it. So there is a temptation to give mechanization the benefit of the (very large) doubt and to adopt it with insufficient justification. The commonest reason advanced in urging mechanization is the inadequacy of the existing indexing services in the organization. These inadequacies are invariably due to one central cause—lack of financial backing, although it is true that the acute shortage of good indexing personnel in the USA is also a strong reason. But if a mechanized system is then installed the expenditure on this always greatly exceeds that regarded as sufficient for its conventional predecessor. There is much evidence for this, and some of the disparities are quite extraordinary. If the mechanized system then gives a better service (as it may do) the difference in economic effort is overlooked. None of us should complain if expenditure on information services multiplies; but the result should not be used as proof of the superiority of non-conventional systems.

Lastly, there is a strong impression that in some cases persons studying the use of computers in IR are attracted to IR because it is an interesting field for exploring computer techniques, rather than for its own sake.

It is almost certain that if these improved resources were put into the expansion and improvement (by known methods) of conventional systems, in the great majority of cases services would be possible which would be highly flexible, able to answer simple and medium requests at great speed and the larger (but much rarer) requests for exhaustive recall only slightly less quickly than the most expensive computer. If this conclusion is reasonable, we may well ask under what conditions is the use of computers justified (if we assume that an equivalent amount of money and effort would be devoted to conventional indexing and searching were the computer *not* used). So we will summarize the advantages offered. Facilities for multiple access are undoubtedly greater than with conventional systems. Closely tied to this is the facility for recording much more exhaustive analysis and indexing without paying an intolerable penalty of cumbersome size. Where the need for extensive correlation (coordination) is imperative these advantages may be decisive. The problem of maintenance is handled more easily in that insertion and deleting of items is combined with excellent printout facilities. Another advantage often claimed is the freedom from fatigue and error enjoyed by the machine. Remembering the high cost of human error disclosed in the Cranfield tests, this might be a significant point. But the steps in which errors mainly occur are those of deciding what a document is about and translating this into the index language, then repeating the process for the questions and devising a search programme. These steps must still be taken by humans, even in mechanized systems, automatic indexing still being in an experimental stage.

The capabilities just described are unlikely to justify computerization of a good conventional system for collections of a moderate size. It solves no problem which cannot be dealt with effectively by conventional means. If we assumed greater support being given to conventional resources (rather than putting it into computerization), they provide all the services offered by a computer system, and more in that the service provided is more flexible. After all, the computer is not the only medium for producing book-form bibliographies and indexes rapidly. Indeed, the use of a computer solely for this purpose would be an uneconomic use of its abilities.

At what point the size of a collection would begin to make conventional card systems cumbersome enough to justify the great leap in costs called for by computerization is not easy to say. Shaw[7] has suggested the figure of fifty thousand or more as a likely one. It is certain that it would require more or less constant use on a reasonable scale to justify the investment represented by such expensive equipment.

At the present time it is probably true to say that the best service a computer can give in IR is to utilize its printout facilities for the production of printed bibliographies and indexes which can be maintained, cumulated and reprinted with relative ease. Bibliographical services such as those provided by the Defense Documentation Center (ASTIA) and by NASA demonstrate this facility. Its implications for organizations whose library users are scattered in different departments and different localities are obvious. The great superiority of the page form over cards in the presentation of an index is widely accepted and only the prohibitive cost of any attempt to update such indexes frequently and regularly has made their wide use impracticable.

A more limited use of computer printout facilities is seen in the production of KWIC indexes which, within the limits set by their producers and within particular subject fields, perform a useful service. That their effectiveness might be greatly improved by allowing controlled keywords to be permuted rather than the words of titles does not depreciate the usefulness of the computer function in making its extremely rapid production possible.

Present research in mechanized aids to IR

The systems approach in mechanized IR implies an attack all along the line—not isolated bits of mechanization linked uneconomically by manual intervals, but a fully mechanized system. This is the long-range objective of current research.

Two main lines of approach are discernible. One is the search for methods of mechanizing the indexing step itself—i.e., getting a computer to 'read' a document, assess its subject matter and 'classify' it. The driving force behind this is the very large economies likely should this objective be attained. It has been said that indexing is the costliest bottleneck in IR; and in the United States, at least, recruitment of good indexers in adequate numbers is increasingly difficult.

The other is the exploration of ways of establishing classes other than by conventional means (i.e., by assessment of the subject content of documents based on intellectual analysis). We all know that the connections established by classifications, thesauri, subject-heading lists, etc., can still miss useful material. Librarians have always provided other approaches in addition to their subject catalogues to try to catch these more elusive and subtle connections; for example, they have provided indexes of authors, issuing bodies, form categories (such as festschriften, and directories) works in particular languages, chronological groupings (e.g., to answer such queries as those for literature on the various *post-war* buildings in the United Kingdom). Other principles for establishing interesting classes would include, for example, those governing the production of an *Index librorum prohibitorum.*

These two approaches converge in that the second, it is hoped, will facilitate the first. This is seen in the work on automatic indexing now being done by Stiles, Swanson, Borko, Giuliano and others. This seeks to establish *subject* classes, it is true; but it is to be done not by intellectual analysis but by noting statistical qualities in the vocabularies of documents which, it is argued, are likely to be correlated with true subject meaning. H. Luhn is generally considered to be the pioneer in this work, although R. H. Richens in this country was referring to its possibilities some fifteen years ago.

At first, simple word and word-pair frequencies were taken as clues to the subject content of a document. To this has been added a number of refinements. These include word order with association—e.g., if two or more keywords occur within four words of each other the whole group is taken to form a significant cluster; location—e.g., if a keyword appears in certain significant parts of the document (title, summary, first and last sentences, etc.) it is given an extra value; the relation between frequency outside the chosen subject field and frequency inside—this may eliminate apparent keywords which, although occurring frequently, are non-potent in defining classes.

The ability to perceive and manipulate the clues above is obviously dependent on computer capabilities—it is simply not practicable in terms of clerical or indexing labour. But as an alternative to the process of *extraction* of significant words to represent subject content as described above, there is being developed a process of machine *assignment* of terms.[8] This implies the existence of a classification of the field in some form or another. Trial documents (in a 'teaching sample') are then assigned to particular classes according to word frequency, as above, and the success of this assignment is assessed by correlating it with human assignment of the same documents. This correlation, it is argued, will disclose the likely predictors of each class and machine indexing is now programmed to recognize these predictors and assign the documents to classes accordingly.

A further development is that of associative indexing and 'clumps'. According to the frequency with which particular terms are used together, association factors are developed and used to define the classes to be searched. For example, if 'cylindrical' and 'body' occur together in a sample body of literature, *some* connection is assumed. If it happens a hundred times the association factor is correspondingly greater, reflecting the 'statistical closeness' of the terms. In an index embodying these factors, a search term is automatically elaborated on; the computer extends its search to the associated terms, even though these are not demanded by the search question. So a request for *Aerodynamic heating* may finally retrieve a document on *blunt bodies of revolution*. This, of course, is no more than what conventional indexing has always done in its classification systems and its syndetic structures. But the road by which the classes are arrived at is different and their value in retrieval power may prove to be more, or less, or equal. The significant point is that they can be arrived at automatically, with all the potentialities for economy which this implies. Incidentally, since the association value is a statistical measure the list of documents finally given to the questioner ranks the documents in an order of probable relevance. If this order proves to be an accurate reflection of the true relevance, here is another very useful instrument for tempering the harsh condition that high recall will be accompanied by low relevance; for the user can take the first ten from the list, say, or the first twenty or so on, adjusting his recall/relevance ratio according to need. An automatic accompaniment of the above computer operations is the provision of printouts giving such data as word and word-pair frequencies and word-association frequencies. The usefulness of these in indexing and searching is obvious. A particular use for them is the derivation of 'weightings' for terms or concepts, a device which is potentially very powerful in controlling relevance (i.e., it narrows the class implied by a term according to its significance in the document concerned: to ask for x with a high weighting is a way of demanding the highly relevant material on x).

Whereas the classes produced by automatic indexing are explicitly subject classes, those produced by citation indexing and by bibliographic coupling are not. To take the latter first: if document A has quoted ten references and, say, three of them are also quoted by document B, then A and B belong to a 'coupling group' characterized by this common feature. Is it a useful collocation from the point of view of IR? The work of Kessler[9] suggests that it may well be in certain conditions. Similarly, the citation index[10] establishes classes defined solely by citation of a single work and these, too, have proved useful in certain circumstances (and most of us would welcome a citation index in the field of documentation in the last decade). The crucial point seems to be whether these non-conventional groupings retrieve a significant number of relevant documents missed by our conventional subject classes. Or if they retrieve substantially the same material, but with the economies made possible by using automatic indexing. Their claims remain to be tested. Another source of class definition which, although not new and not implying a computer in any way, has been investigated and exploited by computer systems is the reader-profile used in the selective dissemination of information (SDI). The fully mechanized system would undoubtedly facilitate the application of this principle, whereby all incoming documents are automatically compared with permanent profiles of the interests of the individual library-users so that all information bearing on their interests is brought to their attention. In fact, this has passed the experimental stage and is now a fairly common feature of mechanized systems.

Conclusion

All these explorations as to what might constitute useful groupings seem to be a reflection of Hulme's theory of literary warrant, formulated some fifty years ago.

Documents are peculiar aggregates of information; their particular shapes and sizes, their methods of attack and their reader-targets are as varied as the multitudinous commodities—the goods and services, in their different packages—of economic life. The problems of matching the products and the consumers are almost comparable in complexity with those with which economists wrestle and, as Hulme said, they are only explicable finally in terms of the laws of supply and demand.

And, to pursue the analogy, in the process of reconciliation there is a place for the supermarket and for the general village store, and for plenty of intermediate levels. J. Lyons may find a computer useful, but this does not mean that the local shop does.

We should be foolish indeed to reject mechanical aids when these offer us economies in what we are already doing, or offer to do more for the same effort. The only criterion in this, as in all decisions of IR, is ultimately the economic one of trying to provide certain services with limited resources. But the history of IR since the war is heavy with examples of premature mechanization and an unfortunate by-product of this has been the neglect of conventional methods at a time when the climate for developing and improving them has been otherwise favourable. Let us hope a better balance can be managed in the future.

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DISCUSSION

Mr J. E. M. Lilley (International Computers and Tabulators Ltd) said it was possible that computers might not be the ideal instrument in IR, but that there was little evidence of serious efforts having been made by librarians to state their precise requirements and to ascertain to what extent these might be met by computers. The latter had certain characteristics such as immense storage and rapid printout, concentration upon which might prove rewarding. The possibilities of cheaper computers in the comparatively near future should be borne in mind as should such techniques as Magnetic Ink Character Recognition.

Mr Cyril Cleverdon (College of Aeronautics, Cranfield) thought the proper use of computers in IR should be to do those jobs we could not easily do ourselves. On this score an outstanding facility was in helping us to produce printed, easily scanned and easily maintained catalogues and bibliographies.

Mr D. S. Longbottom (Shell International Petroleum Co. Ltd) thanked Mr Mills for the clarity of his paper. Regarding recall and relevance, he said the Shell Group had been using for the past four years a form of inverted co-ordinate indexing in which these two factors were largely built-in at the start in the preparation of the Word List and so did not have to be considered so much when recording or retrieving every individual item. Some might think this undesirable, but they had found it a great advantage. He thought that inverted co-ordinate indexing lent itself readily to mechanization because it largely eliminated a personal decision on each item of information. Also, he thought it mechanizable for a large information store and not, as Mr Mills had suggested, suitable only for relatively modest collections.

Mr J. Farradane (Northampton College of Advanced Technology) said that if Mr Mills were a revolutionary he must be an anarchist. In such a new subject field as this we must remain ready to question fundamental assumptions. He challenged Mr Mills's acceptance of the document as the starting point and end point of IR. We were obsessed, he said, with the actual wording of the document and too ready to accept a standard list of words as an adequate basis for retrieval. We needed to know much more about the nature of knowledge and how it should be expressed for IR.

On the question of the relation between recall and relevance recognized by Cranfield, Mr Farradane said he yielded to no-one in his respect for Cleverdon's work. But it was only a beginning. Much more research was needed. The Cranfield findings were not necessarily valid for all systems. The problem of defining relevance was still far from solved and the validity of testing methods must be re-examined again and again.

On mechanization, Mr Farradane said we did not yet know sufficient about the nature of our problems to say whether the computer is the right machine—one could use a steam hammer to crack a nut, but it was not efficient.

In the course of his replies, Mr Mills said that he agreed with most of the comments. A restricted vocabulary such as Mr Longbottom referred to undoubtedly could be effective if carefully controlled, but the effort would always tend to improve recall at the cost of relevance. A restricted vocabulary could hardly expect to enjoy the precision possible with a rich one. As to the mechanization of co-ordinate indexing, the matching of search-terms with descriptor-like terms, against each of which was a record of the documents indexed by them, was the basic searching method of most mechanized systems. What he had queried was the feasibility for large collections of the unmechanized peek-a-boo and card- and book-form Uniterm systems. Optical coincidence was a substitute for mechanization, not a candidate.

Regarding Mr Farradane's comments Mr Mills said that whilst he would not dispute that ultimately we were concerned with knowledge—the information itself—it was a mistake to regard its vehicle—the document—as a red herring. Knowledge did not become knowledge until it was communicable, which for us meant until it was embodied in some record, and the various ways in which it was packaged were certainly pertinent to our problem. Beginning with the documents, closely observing their language and characteristics, was a proven way of establishing our index vocabularies. And we certainly had to end with the documents.

As to testing, he fully agreed with Mr Farradane on the importance of the relevance criterion. Measures of retrieval effectiveness could only be made on matching abilities between index descriptions and search prescriptions, without regard to hindsight as to what the questioner really meant, or really wanted (assuming, of course, that this had been considered when framing the search programme).

RESEARCH ON USERS' NEEDS:
WHERE IS IT GETTING US?

C. W. HANSON, B.SC., F.I.INF.SC.
Head of Research, Aslib

Chairman, Dr W. L. Francis, C.B.E., Director, Grants and Information Divisions, DSIR

37th Annual Conference, University of St Andrews, September 1963

SINCE Bernal made his pilot survey of the use of scientific literature for the 1948 Royal Society Scientific Information Conference, at least three dozen other investigations have been reported of the needs of scientists and engineers for information, of their information gathering habits, and the use to which they put information.

Some of these have been concerned with the people in individual organizations, but have implications elsewhere. Others, including Aslib's own investigations, have had wider aims. Some have been based upon observations and records of what the scientists and engineers themselves did or said, and some upon records of the demands they made upon libraries. There have been both surveys of opinions, and collections of facts.

The results of this mixed batch of investigations have provided us with many semi-quantitative data. The questions I shall try to answer are: how much good has it done us, and how much good can it do us? In particular, do the results of individual investigations support each other generally and add up to something approaching established knowledge, on which we can base confident opinions and take action where appropriate? Or must we be content to say that the results of each project are of benefit only to those directly concerned, or to others in nearly identical circumstances? To answer these questions, we must discover what, if anything, is of general significance among the multitude of discrete results, and determine where the results of the many investigations can be regarded as together yielding valid evidence for useful generalizations.

The first task is to examine the material. Tornudd[1] has published informative abstracts of the results of many of the investigations; and Menzel[2] has attempted to correlate and compare results. Their work has made my job easier; but it has not done it for me, because I am approaching the subject in a different way. I do not intend to describe investigations, nor specifically to summarize, nor to compare results. What I shall try to do is to pick out those aspects of the subject on which I consider that research has given us sufficient evidence to enable us to make positive, if still tentative, assertions which are useful to us in our work—to pinpoint those matters on which the results of research now enable us to express opinions which are reasonably well supported by facts.

The title of this paper is 'Research on users' needs', and the discovery, measurement and classification of the 'needs' of users of information have been among the implicit aims of most of these researches. But real needs are extremely difficult to explore, and in practice most of the investigations have been of users' actions, and of their expressed demands, which is not quite the same thing. Investigations of what kinds of information scientists take observable steps to obtain, of where and how often they seek information, of the demands they make on libraries—these have been the actual subjects of most researches on users' needs. The results reflect real needs, and although they are only partial reflections we should use them for what they are worth while we try to develop research techniques which will enable us to dig deeper—to look into the scientist's mind rather than simply to observe his actions.

Having warned you that the evidence is not as good as one would like, I can turn to my main task, which I will tackle in the following order: first, the general picture of where I think research has given us useful knowledge, under the conventional headings 'keeping up to date' and 'retrospective searching'; second, any major differences in the pattern of needs associated with profession or discipline (scientists, engineers, chemists, physicists, etc.) or with kind of employment (industrial, academic, etc.); and third, the part played by libraries in meeting needs. I shall ignore many matters on which research results, while useful in *specific* circumstances, do not seem to me to be adequate to justify generalizations. For convenience I shall use the word 'scientist' to include engineer and technologist except where I make specific distinctions.

To start with I shall make two broad assumptions, although I have evidence that one of them is not universally true. First I shall assume that in a general way scientists need to 'keep up to date'—this in spite of the fact that seventeen research scientists (2 per cent of a sample) have specifically told Aslib that they did not wish to know what other people were doing in their field of work. Second I shall assume that scientists need to obtain specific information on specific occasions.

Keeping up to date. Evidence about the relative importance of keeping up to date by reading on the one hand, and by other means such as talking to colleagues and attending meetings on the other, is conflicting, so I have not attempted to assess it here; but we do know from observation that scanning current periodicals for this purpose is an almost universal practice—and we know from the results of investigations roughly how many periodicals. The median number of journals scanned regularly per person is about ten. Very few scientists scan less than five or more than twenty. The results from six surveys are in fair agreement, and you can take this figure of ten as a reliable guide when estimating the coverage achieved by current reading, and when planning circulating systems or ordering duplicate copies.

How are these ten journals selected? Current Aslib work provides evidence on this point which I believe to be reliable and worth quoting, although it applies to research scientists only. These confine their regular current reading largely to the specialized journals of their own discipline, plus one or two such journals as *Nature* and the *New Scientist* and sometimes an abstract journal. (38 per cent of research chemists scanned *Chemical Abstracts* regularly, and 20 per cent of research physicists scanned *Physics Abstracts*.)

This is what one would expect. One practical conclusion is that unless the scientist is willing to spend more time reading current journals he cannot go far outside his special field, except at second hand, via abstract journals.

The time he spends reading may seem a very mundane matter, but it is a major factor in determining his intake of information. There is convincing evidence that the average working time spent reading published material (not current only) is about five hours a week. The results of six surveys give the following approximate figures—4½ hours, 5, 5, 4½, 4; and 9 in Scandinavia where much foreign language literature has to be read. About three hours of these five are spent reading current periodicals. If this figure of three hours—about one-twelfth of the working week—be accepted as reasonable, it at once defines this aspect of the 'current awareness' problem as: how can this time be best spent, and how far can it go towards meeting the scientist's need to keep up to date?

I find nothing in research results to suggest that the scientist's reading habits are not sensible ones as far as they go—scanning regularly say eight specialized journals, one or two scientific news journals, and an abstracts journal. But they leave gaps, and these must be recognized. Bradford's law of scattering is sufficiently well established to enable us to say that there will be at least as many articles on a man's subject in journals he does not see regularly, as in those he does. As a whole, the ones he does not see will probably be the less important articles; but any one of them might be vital to him. It seems desirable, therefore, that a scientist's current scanning should nearly always instead of only sometimes include a relevant abstracts journal, unless this is scanned for him by a library or information service.

These not very exciting, but I think well established, bits of knowledge about the scientist's current reading suggest to me that the following generalizations may be valid:

i. The scientist cannot keep *fully* up to date with published literature in his own field solely by reading original papers in current journals, unless he devotes more than three hours a week to this. There is too much literature and not enough time. He can improve matters by scanning abstracts journals.

ii. If he does not spend more time reading then, as the volume of current literature increases, his knowledge of what other people are doing will fall further behind. He will thus become more dependent upon acquiring the knowledge he needs by making specific searches later at the moment when he becomes conscious of needing it—he will become, in fact, more dependent upon libraries, indexes and retrieval systems generally.

Retrospective searching. This brings me to retrospective searching and inquiries—finding what you want when you know you want it. This is a fruitful form of information gathering, because when a scientist seeks specific information he is likely to use it when he gets it. There is little of the waste necessarily associated with current scanning or routine dissemination.

Can his needs, or at any rate his expressed demands, in this field be classified in such a way as to be useful? We are finding that they can.

First, research results indicate that the scientist's specific demands for information are by no means all related directly to his immediate work. Aslib finds that a quarter of them are only marginal or peripheral; and 10 per cent of them quite unconnected with current work. Four other investigators have found roughly the same thing. The exact figures vary, but they all agree on one point: at least a quarter of the scientist's specific demands are for information not directly and obviously related to his current work. This has important implications for librarians, because these demands will be more difficult to foresee than those which are 'dead on' a man's work. It also illustrates the limits of even the best systems of dissemination, tailor-made to fit the individual scientists' known current interests.

Examining further what the scientist seeks or asks for we find that Herner[3] reported that 18 per cent of the demands of atomic scientists were for non-technical information. Evidence about other groups of scientists supports this finding and I think we can take a figure of about 15 per cent as well established. The implications for librarians are obvious.

We have found, in a current Aslib project, that just half the 'acts of library use' in twenty-five libraries on a test day comprised requests for documents specified by the user; about a third comprised requests for information on a subject; the remainder being mostly browsing or reading current journals. I have not yet been able to compare these figures with other data—if they exist—but I thought them worth reporting because they illustrate the fact that scientists do commonly visit their libraries to get information as well as to borrow specified documents. I shall touch on this again later, as there are important qualifications to be added.

I will turn now to the key questions:

—what kind of scientific and technical information do scientists seek, and how often?

—from what kinds of documents do they get it?

—how successful are they in getting it?

—how much effort is involved in getting it?

Here I am drawing upon some of the results of many investigations, including those of Saul Herner[3] in the United States; Cole[4] of British Petroleum; Mote and Angel[5] of Shell Research; Sabel, Terry and Moss[6] of Harwell; and some of our own. But what I am giving is a purely personal and very generalized interpretation.

The first point that strikes me is that something approaching one-fifth of the demand is for a figure, or a single simple fact—physical and chemical constants, for instance, or an answer to a question like 'does dilute $HC1$ attack polystyrene?' Three investigations yielded figures in close agreement, 18 per cent, 17 per cent, and 20 per cent.

This emphasizes the importance of handbooks, data books and similar compilations.

The second point which emerges, though rather less clearly, is that between a quarter and a third of the total demand is for what we at Aslib have classified as 'a description of an object, a process, a method or procedure'. Here we are concerned with the kind of demand that is adequately met by one, or at most two, texts out of perhaps dozens. It involves only a minor search which ends when you have found a few acceptable papers.

Adding these last two types of demand together we see that something like half the total demand is for the kind of information which would not normally necessitate prolonged and deep searches of a mass of literature. It is in essence quick reference work, well within the capacity of quite a modest library with a competent staff.

Some of the remaining demand is for material for browsing to give general ideas and stimulation, and for background reading, not for information to be put to immediate practical use. Some of it is of a kind that may necessitate methodical and often prolonged searches designed to yield all, or a substantial proportion of, the information on a subject. The investigations do not reveal very clearly how numerous the last kind of demands are, or what proportion they are of the total. Nevertheless, I think all the indications are that these major jobs are relatively few, probably about 5 per cent and almost certainly below 15 per cent of the total.*

Consider the following figures which have a bearing on the matter.

Mote and Angel[5] found that, of inquiries taking more than half-an-hour, only 7 per cent involved the provision of fifteen documents or more.

Aslib found that the average number of useful documents provided (per inquiry satisfied by documents) was 3.1.

Cole[4] found that two-thirds of his inquiries were for 'medium coverage of a narrow subject', and were met by the provision of 'a few documents'. Bibliographies were provided in only 9 per cent of the cases.

Aslib found that even research scientists embarking on major projects did not feel that they needed to study a large number of documents before starting their work. Forty per cent (of a sample of about 600) thought that about a dozen documents was enough, and another 40 per cent felt that about half-a-dozen was sufficient.

Looking at the matter from another angle we find that at the Harwell Information Office[6] only 10 per cent of the inquiries took one hour or longer to answer. In the current Aslib inquiry the corresponding figure was 6 per cent. But figures as high as 30 per cent have been reported.

These, and other bits of data, gathered from diverse quarters, are admittedly an inadequate basis for firm conclusions, but they all point in the same direction, and personally I would put forward the following broad generalization with reasonable confidence.

'At least half of the scientists' needs for information are of a kind that can be met by fairly straightforward reference work, by short and partial literature searches, and by the provision of fewer than half-a-dozen selected documents or references. Demands necessitating methodical literature searches of a mass of literature probably account for well under 15 per cent of the total.'

If this generalization is valid it has important consequences. It means that a library which provides facilities for a really good reference service, and for making modest (and far from comprehensive) literature searches, can expect to meet at least half the scientist's demands. It also means that in many individual libraries the provision of voluminous or elaborate tools for major literature searches will not be essential to meet the bulk of the demand, although it may of course be justified if such searches, though few, are important.

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* Since this paper was presented, a large industrial information service has given me the following figures. Of 1,000 inquiries involving more than quick reference work, 238 were major inquiries necessitating substantial effort. Of the latter, only about 5 per cent involved comprehensive literature searches.

The results of all surveys agree in pointing to periodicals as the most used published source of information, with textbooks second. The third place in an Aslib investigation, and in some others, is taken by handbooks, data compilations, and the like. I rather doubt whether the provision and use of the latter in many libraries matches up to their usefulness.

There is general agreement also on the concentration of demand on fairly recent literature. The median age of documents—apart from current journals scanned on circulation — used by participants in the Aslib investigation was five years, and this is typical of many findings.

Differences in the pattern of demand associated with discipline and employer group. So far, I have been speaking of scientists as a whole, using the term loosely to include engineers, technologists and technicians. The very broad generalizations I have made apply to all of them. I shall now consider such marked differences as exist which appear to be associated with discipline, and with kind of employment. Here I shall draw heavily upon our current Aslib investigations, one of which has been particularly concerned with this aspect. In this investigation our main breakdown has been into *a,* scientists and *b,* engineers; and into three groups—people working in industry; people working in academic and teaching institutions; and people working in Government laboratories.

First, we find that the differences in needs and demands for information associated with the kind of employment are on the whole greater than those associated with discipline. That is to say, although there are differences between scientists and engineers as such, and between for instance physicists and chemists, these are less marked than the differences between people, irrespective of discipline, working in industry and those working in, say, academic institutions. Comparing these last two we find that people working in industry wanted information more quickly than the academics; they required more frequently the single fact or figure type of information, and hence made greater use of handbooks and data compilations. They were more inclined to approach their libraries for information, as compared with asking for named documents; and more inclined to entrust the library staff with the job of finding it, instead of searching for it themselves. Their requirements covered a wider range and were more difficult to foresee: a higher percentage of their needs were marginal or peripheral, not directly and obviously connected with their main job. They made greater use of recent literature than the academics, and did less browsing, apart from reading current journals. In most respects people working in Government establishments behaved in much the same way.

This general picture, composed from a large number of discrete facts acquired during our own investigations, is not directly comparable with the results of researches elsewhere, but as far as I can see it is not inconsistent with other people's results. The immediate significance is obvious. In considering users' needs, the type of organization in which they work—industrial or academic—is likely to be the determining factor, not discipline.

Differences associated with discipline, though secondary, do exist. Considering only the broadest breakdown into scientists on the one hand and engineers and technologists on the other, we found the following differences sufficiently marked to be worth mention here.

Scientists' needs were more frequently directly connected with their current work: they were only half as likely as engineers to seek information on marginal or peripheral matters. Scientists used abstract journals twice as much as engineers. They made more use of older literature. And they were more inclined to seek what they wanted for themselves than to ask the library staff.

I have introduced here a new factor—who sought the information?—the user, or the staff of a library or information service? This brings me to the whole question of how the scientist uses libraries to satisfy his needs.

We are on difficult ground here because needs, and the facilities for meeting them, interact. For instance, the mere existence of a convenient and a well-organized collection of literature may suggest to a scientist possibilities which he would not otherwise have thought of. His conscious *needs* for information are stimulated by the existence of means of meeting them, and so are more numerous. On the other hand the man lacking such resources may drift to a stop for lack of stimulation and ideas: so his conscious needs are few. To give one illustration: Johnson[7] of British Insulated Callender Cables has said that the use of his company's internal reports multiplied seven times after he had provided an index to them on aspect punched cards: that is to say, the need for information contained in the reports became apparent and was translated into effective demand only when satisfactory means of finding it were provided.

Most researches of the kind I am discussing have been concerned with what use scientists make of their existing facilities, not with what use they would make of others which they have not got. The results are tied to existing conditions. In general, I think they indicate that we have a long way to go before we can say that scientific and technical libraries are being used, literally, 'for all they are worth'.

Although the results of individual researches do not yet add up to anything like established knowledge, I think they do suggest that we have no reason to feel complacent about the part we play. I will try to deploy some of the evidence that causes me to say this.

We all know from experience that some scientists prefer to consult people rather than documents. The extent to which they approach people first, or by-pass libraries altogether, has been estimated by various observers, and figures between 25 per cent and 50 per cent have been reported. Aslib found that about a third of the people who finally turned up in the library on the test day had tried to get the information they needed somewhere else first. These individual figures are not in themselves important, but they do indicate that, for whatever reason, a substantial proportion of the people who need information do not seek it first, or even at all, in libraries, although the specific function of libraries is to provide information. Other figures from the current Aslib investigations point in the same direction. One set of figures which I must quote is, on the face of it, an alarming commentary on our services in one respect, and on our public image. Some six hundred research scientists gave us details of literature they had discovered which, had it been found earlier, would have caused them to alter their research in some way, or would have saved them time or money. Of 238 such cases, in only three, just over 1 per cent, was the document drawn to their attention by library staff. None were discovered via the library card index. The researchers were much more indebted to other people (33 per cent), to cited references (18 per cent), and to chance (16 per cent). Very sobering also are the opinions of these same research scientists when asked to rank in order of usefulness twelve ways of getting information. 'Ask the librarian' came last. The results of some other investigations, although not strictly comparable, also raise serious doubts about the scientists' confidence in libraries and librarians.

This is by no means the whole story: I am deliberately concentrating here upon our weaknesses. I shall turn to our successes in a moment. But before I do so I want to present another set of figures which illustrates the extent to which various classes of user entrust the library staff with the job of obtaining information. I am drawing solely upon Aslib results here, because I can find no others.

'Acts of library use' (*total* 643)

TABLE 1

Ratio of numbers of 'acts' where the work was done by the user alone to the numbers where the work was done by, or with the assistance of, library staff.

		Ratio Self use : library assistance
Scientists	—in industrial firms, using firm's library	1.7 : 1
,,	—in Government establishments, using the establishment's library	2.3 : 1
,,	—in academic institutions, using institution's library	2.8 : 1
,,	—when using learned society libraries	1 : 3.2
Engineers	—in industrial firms,	1 : 1.3
,,	—in Government establishments	1 : 2.3
,,	—in academic institutions	1 : 1.2
,,	—when using learned society libraries	1 : 11.0 (small sample)

TABLE 2

'Acts of library use' comprising:

	(%)
User search	55
Librarian search	34
Joint search	7
No search—not seeking information	4

It is at once obvious from Table 1 that scientists usually did the work themselves, whereas engineers usually asked the library staff to do it or to help. And that both scientists and engineers, when using learned society libraries, leaned heavily on the services of the library staff.

It is obvious from Table 2 that, in total, the users in this sample themselves sought what they wanted more often than they delegated the task to the library. Necessarily or unnecessarily, for good or ill, many users were not relieved of their information-seeking tasks by the library.

Here I must state categorically that I fully accept the necessity for users to do some of the job of searching for information themselves: how much *must* be done by them, and how much could be done for them by a really first-class information service we do not yet know. What I am suggesting is that users in general, even in existing circumstances, are probably not relieved of as much of their information-gathering tasks as they could be, and that one apparent reason for this is lack of confidence in library and information services.

This is the dark side of the picture. Now let me turn to the rosy side. This introduces some apparent contradictions with what I have just said. These I shall discuss. I cannot find reliable data showing the proportion of people entitled to use a particular library who do in fact do so. There is evidence, however, that those who *do* use it do so fairly frequently. In the Aslib investigation, three-quarters of the people who used the library on the test day said they used it at least once a week. This is not atypical, and suggests that library services are found to be satisfactory, in some respects at least, by those who do use them. When people have been asked, in the course of investigations, 'Did you get what you wanted?' the answers have been encouraging. A success rate of about 90 per cent is commonly reported. In the Aslib inquiry the figure was 83 per cent successes, plus 7 per cent partial successes. In three other inquiries the success rates were 94 per cent, 91 per cent, and 94 per cent respectively. Moreover not only did users generally get what they wanted—they got it quickly. In the Aslib inquiry, in only 4.5 per cent of the cases did the successful inquirer say he failed to get what he wanted in time or sooner, in spite of the fact that in one-fifth of the cases the information was needed within a matter of minutes or hours.

This last group of data suggests that libraries are doing a good job, are satisfying a large proportion of the demands made on them, and are doing so promptly. On the other hand, the earlier group of figures suggested that libraries were not relieving scientists of anything like all their information-seeking tasks, and that scientists do not look to libraries as their key sources of information. Superficially there may appear to be a contradiction; but I believe both statements are true. The position as I see it is this.

Scientists (employing the term in the wide sense) use libraries extensively for obtaining specific documents; for reference purposes; and for fairly elementary information searches. These form at least half of their needs, and for these purposes the library services are quick and successful. The user entrusts the library staff with some of this work although even here, where it should seldom be necessary, he does much of it himself.

When his needs are more complex, more difficult to define, and of greater significance to him he is less inclined to consider the library an important source of help, and more inclined to seek information elsewhere. If he does come to the library with his difficult and important problems, his tendency to search for what he wants himself rather than entrust the library staff with the search is even greater.

To put it crudely: library services are accepted as a means of meeting simple needs, which are many. They are not accepted as an obvious source of help with difficult problems. In neither case is it generally true that the job of finding information is entrusted to the library staff, although engineers as a group do seek their assistance more often than they do the job themselves. Libraries and information services, although set up for the specific purpose of collecting and providing information, are not regarded by scientists as key sources of information except for limited purposes. And their staffs, although specialists in information handling, are not entrusted with much of the work.

This is a very broad generalization, expressed, I know, more strongly than the direct evidence warrants; but I think it needs saying. If it is anything like a true picture, it suggests what we need to do if we are to increase our contribution to the communication of specialized knowledge. Basically we need to deepen our understanding of our customers' work, and hence of their needs, so that they will find it beneficial to bring to us their difficult problems as well as the easier ones, and to entrust us as specialists in documentation with more of the job of finding information rather than doing so much of it themselves, as amateurs. It is essentially a matter of more high-calibre staff in libraries and information services, and more publicity for these services.

You will realize that there is implicit in what I have just said an assumption that good information services can relieve scientists of much more of their information-seeking tasks than most existing services commonly do at present. I have no more convincing justification for this assumption than my knowledge of the work being done now by the best information services; and I recognize that in existing circumstances many libraries are not able, through lack of appropriate staff, to undertake more than rather simple tasks, so that the user may well be wise to do most of his own searching. Indeed, in our investigation we have found indications that as things are the user is more successful, and slightly quicker, in finding what he wants than the library staff.

Nevertheless I think we are justified in believing that a competent scientist trained in information handling, or a competent librarian with a specialist knowledge of scientific literature, can relieve his colleagues in research and production of much of the work they now do themselves, and that this division of labour would be economic.

Meanwhile, research results have yielded generalizations about the pattern of demand which can be applied to the improvement of existing services. I will mention four.

i. In general, about half the demand for information is of a kind that can be met satisfactorily by reference work and minor literature searches;

ii. About a quarter of the demand is not directly and obviously related to current work and interests;

iii. There are significant differences in the pattern of demands made on libraries by people working in industry, and by those in academic institutions; by scientists, and by engineers;

iv. Libraries and their staffs at present play only a modest part in meeting the scientists' total need for information.

This is the end of my paper proper. Before sitting down, however, I shall tell you briefly about the two current Aslib researches which have a bearing on it. I have referred to them in my paper, and quoted a few preliminary results, and it will clarify matters if I tell you rapidly what we are doing and what stage we have reached.

First, Mrs Slater has been investigating in detail each 'act of library use'—about six hundred in all—which took place in twenty-five technical libraries during a specified test day. The libraries comprised those of industrial firms, Government research establishments, universities and technical colleges, and learned societies. The information was obtained on the spot by questionnaire, supplemented by observation, Mrs Slater or I or both being present as observers throughout the test day. We have been assisted throughout the research by a project group under the leadership of Professor Bernal. Mrs Slater has just completed the first draft of a full report of the investigation, and we hope to issue a report in a suitable form by the end of the year.

Second, Mr Martyn has been investigating the literature searching done by research scientists, in succession to Mrs Phillips who started this project. About eight hundred scientists actively engaged in research gave us, at the first stage, information about their projects, the literature searches they had made, and the extent to which they felt confident that they had all the necessary information. At the second stage they told us about the documents found later which they wished they had discovered earlier, and how these were discovered. The results have been put on punched cards and analysed. We are at present studying their significance and hope to produce a report by the end of the year. This research also has been assisted by a project group, led by Mr Fishenden.

Both Mrs Slater's and Mr Martyn's preliminary findings have influenced me considerably in the preparation of this paper, but the interpretation of them is mine.

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DISCUSSION

Mr R.M. Fishenden (Atomic Energy Research Establishment, Harwell) in a written contribution to the discussion said: In his excellent paper Mr Hanson has made some broad generalizations. For the sake of brevity I do the same in this contribution to the discussion.

First then the paper over-emphasizes the importance of the written word in communication. The information which scientists want consists primarily of the results and other details of work done by other scientists. Ideally they would like to obtain this information first hand, and any other method of communication, either via the written word or via an information officer, is inevitably a second best. Indeed, a few people—pure research workers in narrow fields—come near to achieving the ideal. They are in the happy position of being able to know personally nearly all other workers in their field, and to meet them at conferences. They have no need of a library or perhaps even of periodicals, to keep them up to date.

Second, the paper over-emphasizes the importance of that part of the scientific communication network which passes through libraries. For example, Mr Hanson says 'that library services are accepted as a means of meeting simple needs which are many, but not as an obvious source of help with difficult problems.' He concludes that librarians must deepen their understanding of customers' work. I accept, and indeed endorse, Hanson's remarks, but draw different conclusions. The frequency with which new researches are started, requiring major searches of the literature, is relatively low, and the small number of major queries, included in most samples which have been analysed, is not surprising. Furthermore, the information man cannot be an expert in all scientific fields. If only for this reason, most scientists undertaking a major literature search feel that they must undertake themselves at least that part of the work which involves critical selection. Surely the right conclusion is that the essential task of the library is to make sure that the means are available for carrying out all those searches of the literature which research workers require, but that not too much emphasis should be placed on the question whether the actual searching is done by library staff or laboratory workers.

Another surely very obvious conclusion is that only a relatively small part of the communication network in a research establishment passes through Library. Certainly, most information offices would be flooded if it did. It is, in any case, more important to ensure that the network is efficient than to increase the proportion flowing through the library. For these reasons, the results of surveys which concern themselves exclusively with library operations must be treated with some reserve.

It follows in turn that any satisfactory investigation of communication problems must involve bothering the laboratory scientist with questionnaires. We should not be too apologetic about this. Scientific research is expensive—often very expensive. By comparison, library and information activities, or at least those of a conventional kind, are relatively cheap. Needless duplication or inefficiency in research activities resulting from lack of available information cannot be justified.

Mr C.A. Wise (Rugby College of Engineering Technology) thought that the place to demonstrate the importance of our information service to our future research scientists and engineers was in the libraries of our universities and colleges. There was little evidence that information departments existed in any British university libraries, or that there were any plans for such services to undergraduates and university research workers and lecturing staff. He suggested that a survey be made of information services in British universities and colleges, the results to be published in *Aslib Proceedings.* Secondly he understood that computer manufacturers were anxious to design computer hardware to cope with indexing and information retrieval for library purposes. He suggested that a panel of Aslib members interested in mechanization should meet to determine the problems to be solved, and later arrange to meet representatives of the hardware manufacturers.

Mr J. S. Rippon (The Metal Box Co. Ltd) said that in answer to points already raised some remarks about practice at the Metal Box Company might be helpful. Firstly, in their Research Department, the effort involved in reading abstracts journals was alleviated to some extent by encouraging senior scientists and technologists in each Section to share between them the work of scanning the major abstracts journals in their field. Each person looked at one or two sections of each journal and as well as picking out items of interest to himself, drew attention to items that his immediate colleagues should see, or that the information staff should record for future reference. The information staff played their part by looking through the 'fringe' journals and directing attention to pertinent items their users would not normally see. Secondly, at the beginning of any new research project it was usual for the workers concerned to consult the Information Section and, when appropriate, to ask for a survey to be made of existing knowledge on the subject. The information staff were regarded as part of the research team and were kept constantly in touch with the work and interests of their users. When this kind of relationship was established, the help of the information specialist would be sought when needed. Unless there was this spirit of collaboration it was doubtful whether organized procedures for instituting searches would be effective.

Mr B. Agard Evans (Ministry of Public Building and Works) congratulated Mr Hanson on the coherent presentation of his researches. He hoped they would be regarded as preliminary surveys, e.g., was he satisfied with the library service? The Ministry had large numbers of small libraries—good and bad—and when he asked the users if they were satisfied with the library service, the users of the worst libraries expressed the greatest satisfaction with the service they got! One could regard the market research so far as establishing what was in existence, but the importance of the potential market was so much greater. Bernal had said our job was not only to answer the questions asked but even more to answer the questions which had not been asked! Aslib's progress in nearly forty years had been made by conducting a sales campaign. The architect and the engineer would generally not seek the information unless it was actually put before him. This work could be done in a small research establishment, working as a team; but in larger establishments it required a library liaison officer appointed within each division, with the main task of actually getting the material and placing it before the officers of the Division; not in the form of abstracts, or references, but the document itself!

Dr D. J. Campbell (Pressed Steel Co. Ltd), commenting on Mr Rippon's remarks, said he thought it very dangerous to entrust the scanning of abstract journals to specialist staff. They would scan them for their own interests, or that of their team, but Dr Campbell said he had never found one who would consistently scan from the viewpoint of the whole organization, or establishment, unless that person was in charge of it, or in a very senior position. He would normally then be too busy to do this work.

Dr H. Coblans (CERN) thought that they should be grateful to Mr Hanson for giving them so useful and solid a basis for the hunches they usually worked on in assessing user needs and their approaches to library and information services. He would like to make two points. His first question was on exhaustive searching. In most papers or discussion on the use of machines for subject selection there was usually a tacit (or sometimes even explicitly stated) assumption that the average user wanted a comprehensive, almost complete bibliography on his subject. How true was this? If more than 50 per cent of requests were of this kind then there was a strong case for the great outlay of effort and money to 'computerize'. But if it only represented a small fraction, as had been hinted by Mr Hanson, then the case for mechanization became much weaker. Furthermore, he was convinced that most inquirers would only be embarrassed by the vast number of documents on a subject which such exhaustive searching would produce. What they needed probably was a small number of relevant documents; i.e. more intensive classification. His second point referred to how one could influence the quality of library usage in the future, how ensure that Mr Hanson's figures in years to come would be better. He would suggest that one hope lay in more regular courses of instruction to graduates of all types of schools on the literature of their subjects and on the use of documentation services.

Mr Hanson stated that the available evidence convinced him that the need for major comprehensive literature searches was small, probably only about 5 per cent of the total demand.

In Aslib's survey there were no such cases identified among six hundred demands on the test day.

Miss M. D. Gauntlett (Kodak Ltd) said that a disquieting fact emerging from the recent Aslib survey was the attitude of research scientists towards a library. The speaker had stated that one-third of users had sought information elsewhere before consulting the library; also that they placed the librarian eighth amongst sources of information. Would the speaker enlarge on this by telling them the seven preferred approaches?

Mr Hanson replied that the research scientist placed various means of getting information in the following order: following up cited references; 'keeping up' with current literature; using journal indexes; conversation with colleagues; . . . with 'using the library card index', and 'asking the librarian' last. Those were opinions. When they were asked how they found in the end the documents they wished they had had earlier, their answers were: recommendation by colleagues, 33 per cent; cited in written paper 18 per cent; chance, while reading, 16 per cent; . . . with 'attention drawn by library staff' 1 per cent! These figures did not of course mean that the library services were no use—no doubt the journals in which references were cited, and the journals used for 'keeping up', came from the library. It did show, however, that the library staff were not deliberately consulted as experts.

Mr A. Gordon Foster (Furniture Industry Research Association) said Mr Hanson had mentioned that in one organization demands on a service had increased seven times when the service had been made easier to use. This seemed to indicate that information services were perhaps not fulfilling their role—were not being used because they were too difficult to use. In industry the need to adapt the equipment on the machine to the man who worked it was recognized, and ergonomic research was being carried out. Should not the same be done for information work—and the ergonomic requirements of the information service users studied? In his own small organization for the furniture industry this had been attempted on a small scale and the few experiments they had been able to make had shown interesting results. He felt that sort of research should be undertaken on a national scale to help in the dissemination and use of information—particularly in technology—to help to shorten the technological development time-lag.

Mr J. Farradane (Northampton College of Advanced Technology) said Mr Hanson's figures clearly showed that the greatest resistance to the use of information services appeared in the academic scientist. But it should be remembered that the academic man taught the undergraduate who was the individual researcher and manager of tomorrow. If the undergraduate received even a little training in the use of libraries and information services he would then better understand their value and how to use them. Mr Farradane said he had often experienced at first hand the ignorance and resistance of this academic scientist. If the position were to be improved, action must be taken at the root of the trouble. There must be a campaign to get adequate instruction given at the undergraduate and early post-graduate stage in universities, colleges of advanced technology and technical colleges.

The Chairman asked whether information officers in research departments were invited by the research staff who were starting a new line of research to provide literature references or summaries of earlier work in the field in question.

Mr H. Stephens (British Hydromechanics Research Association) said he would like to ask Mr Hanson to what extent the reluctance of scientists to use library and information centres was due to the possibility that they searched abstract journals which were, in fact, prepared by information centres. He suspected that in the field of hydromechanics, which was covered by the *B.H.R.A. Abstract Bulletin,* many scientists used this accumulated store of information for selecting a small number of prime papers which would probably give them sufficient information and background for a proposed piece of research work.

Mr Hanson agreed, and stated that the Aslib investigator found that active dissemination often made inquiries to the library unnecessary.

Mr Stephens continued: regarding the Chairman's question on the kind of co-operation between information and research scientist, he would like to comment on the position of his own research association, which was probably similar to other research associations. Consultation before commencement of research, and co-operation once a project was started, was usually very good between research staff and the Information Department at the research association. The Information Officer was, in fact, invited to all research group meetings automatically. Similarly, but on a more personal basis, there was a great deal of consultation between the research staff of member firms and the Association's Information Department. The good co-operation was probably due to the policy adopted at B.H.R.A. whereby it was usual for a new graduate, on taking up employment, to spend about three to six months in the Information Department. During this period he became familiarized with the research work in progress and with the literature of the subject field covered by the Association, especially that in which he was to carry out future research. They had found that in most cases these graduates became very information conscious and, as a result, there was good communication after that initial training period. Lastly, he said, on the subject of extensive literature searches, he would like to mention an instance where they had found that such a search proved of great value and also economical. In that particular case they had been asked to prepare a bibliography on fluid sealing, at a conference given for the benefit of scientists and engineers who were all working, more or less simultaneously, on seals research and development. They had found it difficult to find relevant literature and data in this rapidly growing field of activity. They therefore had prepared a well subject-indexed bibliography, including many abstracts specially prepared by seal technologists, covering a time period of about ten years. This had now become a standard bibliographical work.

Mr A. H. Holloway (Admiralty Centre for Scientific Information and Liaison) said that the experience of many information officers was in general agreement with Mr Hanson's conclusions, and the fact that research scientists were often reluctant to use information services had a number of causes: one was that many, as students, were instructed how to make use of the literature for themselves; another that a large proportion of their needs involved evaluation of the documents which were brought up, and few librarians were competent to carry out useful evaluations.

THE PRESENT STATE OF RESEARCH INTO THE COMMUNICATION OF INFORMATION

B. C. VICKERY, M.A.
Deputy Director, National Lending Library for Science and Technology

Chairman, L. T. Wilkins, Deputy Director, Home Office Research Unit

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ALL over the world—in research laboratories, universities, factories, plantations, hospitals—there are people wanting information. All over the world, in those same places, there are people generating information. To direct the streams of information from its innumerable sources into central reservoirs, and then to channel it as required to those who need it—this is the problem we call 'the communication of information'. Documentation is the transfer of information through the medium of documents, and it covers a large part, though not all, of the problem under discussion. This problem is not new: it has been with us for millennia. The librarians of Alexandria knew about it. The translation academies of Baghdad tackled it. Bibliographers down the centuries have kept track of recorded information. There are numerous well-tried methods of transferring information. Why is there such a demand, now, for research into the problem?

The volume of information is growing exponentially, consequently the effort needed to collect and channel it is increasing at least as fast. More resources—intellectual and material—are needed to handle the transfer of information. Yet this is occurring at the very time when there is an equally urgent need for skilled labour in many other fields. We are therefore faced with the problem of husbanding our resources—of rationalizing information transfer so that specialists may be served as efficiently and as economically as possible. It is this that has imperatively pointed to the need for research.

The results of research

Research into documentation is not a pure science. Its aim should be quite practical—to devise new methods of information transfer and to provide data about the effectiveness of methods both old and new, data on which decisions can be based. Investigations that produce only 'curious information' that is 'of interest to know' are largely wasted effort. To every piece of work in this field we must put the blunt question, 'So what?'

Against this background, can we assess what documentation research has so far achieved? I have attempted two or three surveys in the past[1] and other reviews have been published.[2] I would like now to give a personal summary, concentrating particularly on studies of the flow of information among scientists. I have left information retrieval to be discussed by Mr Mills.

First, research has given us a descriptive account of the pattern of communication, and in particular has provided quantitative measures of information flow where our previous knowledge had been intuitive and qualitative. As Mr Hanson has shown, we now have reasonably reliable estimates of the volume of literature in different fields. We know roughly what amounts of time various groups of users spend on communication, and in what ways they use this time. We have some idea of the relative importance of different sources of information. Such knowledge as this is useful as a step towards understanding the whole complex process of information transfer. It helps us to pattern our services to suit the present behaviour of our users. But it does not yet give much guidance on how to improve the situation.

Second, a more detailed examination of research results enables us to formulate some general propositions. The most fruitful of these, so far, is that the frequency of use of most information-bearing documents tends to decrease as they get older. This has far-reaching implications for library storage policies—implications that are becoming understood in science and technology but which are not fully accepted by libraries in other fields.

Other generalizations can be derived from documentation research, but it is not so easy to decide on their implications. Let me list a few of these results:

1. Some types of user use literature more than others—e.g., high-ranking scientists read more than low-ranking, pure scientists more than technologists.
2. Some types of literature are used more than others—e.g., journals more widely than abstracts, native language articles more than foreign.
3. Users read more for some purposes than for others—e.g., more often for specific data than for general interest.

By themselves such results do not give guidance for action, because we must first decide, is the observed pattern of use to be accepted as the optimal pattern? For example, if it is accepted that pure scientists *should* read more than technologists, then our decision may be to emphasize literature provision for the pure scientist. But if we reject this view, then the observed pattern will lead us to do more to stimulate reading by technologists. All these purely descriptive generalizations can only lead to decisions if we have independently derived standards towards which we should aim.

So far, research has done little to provide data on which to base such standards. It must find ways of answering such questions as: 'Do technologists work more effectively if they read more?' or, 'Is failure to read foreign material detrimental to research?' In short, research must find ways of relating the use of information and of various forms of documentation to the working efficiency of users. In the most sweeping terms, research must discover how much it would matter to the scientist if he stopped reading altogether.

Other generalizations to be found in the research literature are definitely in the 'so what?' category. For example, methods of information search are influenced by the working environment—but unless we know which search methods are the most effective, and what features of the environment encourage them, the generalization is valueless. Again, those who read a lot read fast—but which is cause and which is effect, or are both dependent on native intelligence? Some research results are too general to be of use—e.g., ready accessibility of an information source, or familiarity with it, stimulates its use. One generalization seems worth emphasizing—repetition of information leads to use, so perhaps attempts to avoid duplicate publication are misplaced.

I have been considering only the general implications of documentation research results. In fact, of course, most research is of necessity limited in scope, often limited to a study of communication in a particular institution. The results may have real local value—they may indicate what measures are needed to improve information flow in a particular establishment. But local conditions vary so widely that the results may not be generally applicable. It is far more difficult to obtain results that have general validity and on which national decisions can be based.

Targets for research

My general impression of research into the communication of information is that—except perhaps at the local level—the harvest of results upon which we can base decisions has so far been small in relation to the time and money expended. I think that this is basically because communication is a complex and difficult field of research, and the appropriate techniques and traditions are not yet established in documentation. It is probable that these difficulties will not readily be overcome. Nevertheless, it seems possible to enunciate some principles that will contribute to a valid research methodology, and a first step would be to get these more widely discussed. I have therefore set out for consideration, in the Appendix to this paper, a series of notes on documentation research.

The diagram in the Appendix is a sketch of channels between Information and User. An item of information may be recorded in several publications; a publication may be recorded in several guides; both publications and guides are held in many libraries. Transfer of information to the user fails if there is a blockage at any point along the chosen channel. If the user does not know what library to use, there is a block in channel LU. If he does not know what guides to use, or the library does not hold appropriate guides, the block is in GL. If the coverage of or the index to the guide is inadequate, the block is in PG. If the publication is not available through the library system, the block is in PL. If the information is inadequately reported in the publication, or is in an unreadable foreign language, the block is in IP.

A large part of documentation research has been concentrated on uncovering potential blocks in channel PG: the coverage of abstracts, indexes, catalogues and bibliographies, and their efficiency in retrieval. There has been less study of blocks in the other channels, and we really do not know their relative importance. It may be, for example, that channel GL—knowledge about and availability of guides to the literature—is of major importance. More research is needed to determine the contribution of each block to communication failure.

For any specialist library or information service, targets for research are relatively simple to suggest, though actual execution of the research may be far from simple. No specialist service can be comprehensive, so the problem is to determine—by studies of informed use—what publications should be acquired and kept (channel PL); what guides to them should be acquired (GL) or constructed (PG); what user education is needed (LU); and what aid users need in extracting information from publications (IP).

Again, one can suggest information that the publisher of a bibliographic guide might seek. How complete is the guide's coverage? Can studies of informed use provide principles for excluding certain material? For what types of search is the guide used? If the guide is an abstracting journal, what is the relative importance of *a,* the subject arrangement, *b,* the abstract, *c,* indexes? How efficient are the indexes in retrieval?

It is far less simple to suggest research targets on which national decisions can be based. As the diagram in the Appendix illustrates, at each stage in the chain from I to U there is duplication: several publications report the same information; several guides record the same publication; several libraries store the same material. Whenever financial subsidy is involved—and this is increasingly the case—data is required to permit a rational allocation of resources. Research must therefore find ways of assessing the functions and relative utility of different publications, of different guides, of different libraries.

I have no cut-and-dried research plans to put forward that might provide the needed data. But I would like to spend a few minutes describing a survey in progress at the National Lending Library, and give some idea of what information we are trying to collect. Some results will only be of local use, others may be of more general import.

The NLL survey

The following details are being recorded for each request for a serial received by the NLL during a period of twelve months: the borrowing organization, the serial, its country of origin, the year and month of the issue requested, its language, and whether and how the request was satisfied. During May 1963 a questionnaire was sent to each individual originating a request, asking for further details.

The data collected can be analysed in various ways as a guide to internal policy.

1. Serials with a high figure in the category 'satisfied after a waiting period' may need duplication to cope with the demand.
2. Ranking serials by frequency of use will enable us to adjust the holdings of our 'heavily used' store and the list of heavily used titles that are part-bound.
3. Failures to supply missing issues, or issues earlier than our holdings, will indicate gaps that may need to be filled.
4. Serials not held at all by NLL may be analysed by country to indicate countries for which a special acquisition drive may be needed.
5. The list of serials requested will be matched against total NLL serial holdings to give a list of serials not requested. These will be individually examined to see if continued subscription is justified. Only low-grade material will be eliminated.

As can be seen, these data are wholly concerned with channel PL in the Appendix diagram, the adequacy of NLL stock. Our further analysis will be concerned with channels PG, GL and LU.

6. The list of serials not requested—after screening as in analysis 5—will be annotated as to subject and language. The extent to which these serials are covered by published abstracts and indexes will be determined. Any serial not so covered will be brought to the attention of an appropriate Anglo-Saxon organization.

7. Analysis of the origins of the references (recorded in the May questionnaire) will provide data on the relative importance of published abstracts, indexes and reviews compared to other sources of references.

8. The individual abstracting, indexing and review publications reported will be ranked in frequency of use.

9. By analysis of other data in the questionnaire we hope to throw light on *a*, the relative values of a full abstract and a bare title; *b*, whether the delayed appearance of abstracts is felt to be detrimental to research; *c*, the extent to which users borrow items in subject fields different from that in which they were trained.

10. We hope also to analyse requests by type of borrowing organization—e.g., industrial, university, public library—and to correlate this with the results of a further questionnaire on the availability of bibliographic guides in these organizations.

The support of research

This brief outline of the NLL survey brings me to the final question to be considered in this session of the conference: who undertakes research and how can it be stimulated?

An examination of the National Science Foundation *Current Research and Development in Scientific Documentation* reveals about six types of organization working in this field. The first five groups are usually supported by government funds.

1. Governmental organizations such as the AEC, ASTIA, the Library of Congress, the US Patent Office, the National Library of Medicine. In the United Kingdom, as well as the NLL there are the National Physical Laboratory and the Atomic Energy Authority; in Europe, the CNRS, Euratom and others.

2. Bibliographic organizations such as Aslib, Chemical Abstracts, and the Gmelin centre.

3. Scientific societies in the United States—the chemists, biologists, physicists, engineers, mathematicians, and so on.

4. University and college departments—again mostly in the United States, but we must not forget Cranfield.

5. Documentation consultants of all kinds—some with well-known names such as Taube, Herner, Mooers, Diebold, Garfield, others more recently sprung into the field.

6. And finally the group more independent of government finance, manufacturing firms—some with equipment to sell, others with internal information problems of their own.

In the USA the main source of government funds for documentation research is the National Science Foundation, Office of Science Information Service.[3] Its mission is to improve the control and dissemination of scientific information in the United States. The Office is concentrating on two basic kinds of effort: *a,* to promote the study of new and better techniques and systems, and *b,* to maintain and improve existing services. It operates primarily by means of grants. During the fiscal year 1962, about 230 grants were made, totalling \$7½ million. The money was used as follows (in thousands of dollars):

		($000)
Support of scientific publications		2,600
including	Primary publications	830
	Abstracts and indexes	1,140
	Studies on publications	630
Provision of foreign science information		2,500
including	Translation subsidy	1,600
Support of Government and other information services		800
Documentation research		1,545
including	Studies of user needs	60
	Information retrieval	600
	Mechanical translation	630
	Evaluation of systems	140

Over the six years 1957–62, the Council on Library Resources granted nearly \$5 million for projects in the following fields:[4]

Bibliographic access (catalogues, bibliographies, indexing, etc.)
Physical access (acquisition, library storage, care of books, photocopying, etc.)
Library administration
Fact-finding and planning for research and development.

In the United Kingdom, the main source of government support for documentation research is the Department of Scientific and Industrial Research. Part of the Department's annual grant to Aslib is earmarked for research. In addition four grants have been awarded to university and college departments that are working in this field, and the Department is prepared to support other worth-while projects with grant aid. Some international support has come from UNESCO and from NATO.

I am doubtful whether documentation research has been much held back in this country by lack of financial support, although it must be admitted that until recently managements of all kinds—both public and private—have not been convinced of its value. The main difficulty is still, I believe, the scarcity of people with sufficient vision and energy to formulate research projects and sell them to sponsors. Where such people exist—as in the Aslib staff, at Cranfield, in the Atomic Energy Authority, in some university departments, research stations and industrial firms—new ideas for information transfer are developed and tested.

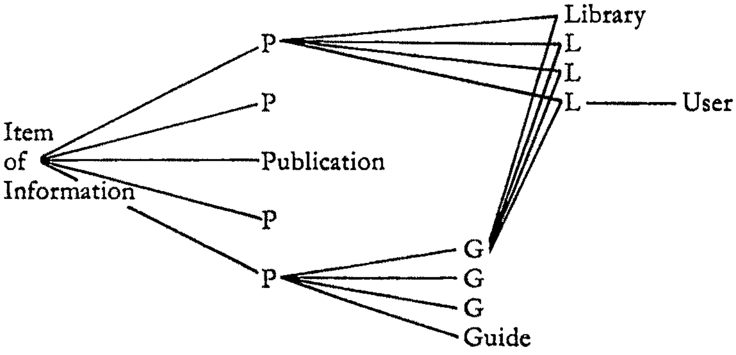
Documentary information is now so vast and so varied that it throws up innumerable problems, local, national and international. There is so much that we do not know about the communication of information that almost any methodologically valid research can throw useful light on some corner of the field. Our present problem is not so much to 'co-ordinate' research as to encourage people with ideas to do something about them.

How can I summarize this survey of the present state of research into the communication? There has been a good deal of activity in this field during the last decade, but the work has not been as fruitful as we could wish. This is due to the complexity of the field and our lack of research experience. I believe these difficulties are being overcome, and that more usable research results will become available. There are two keys to success: clear formulation of the questions a project aims to answer, and vigorous lobbying to win support for it. Good research results from individual effort, not from the deliberations of a co-ordinating committee.

APPENDIX

NOTES ON DOCUMENTATION RESEARCH

1. Documentation is concerned with the transfer of information between one person and another, through the medium of documents. It is to effect this transfer that documents are produced, disseminated and publicized. To conserve human resources, it is necessary to make the transfer with maximum effectiveness and minimum cost. Decisions must be taken on what and how to produce, disseminate and publicize.
2. Information flows from source to user through a succession of channels. Each link is multiple—the same information may be published more than once, the same publication may be recorded in more than one guide, and so on. The situation is summarized in the following diagram.



3. A communication failure may be due to a block in any channel between I and U. The flow can be studied from either end. From the left, failures to publish, to record in guides, to make available in libraries, to reach the user. From the right, failures to seek a library, to use the right guide, to find a reference in the guide, to locate a publication, to extract information from the publication. For successful communication there must be no block in either direction.

4. Research to determine the importance of blocks in each channel will indicate which channels need to be widened—what information links need to be made more effective.
5. Where there is a multiplicity of channels carrying the same information, research to determine their relative effectiveness will indicate where the information system may be simplified and made more economic.
6. Research in documentation takes many forms. Its simplest yet most essential form is the application of a new idea to whatever material comes to hand. Much publishable research is of this personal kind: the analysis of a library procedure, the evaluation of reference books or periodicals, the formulation of a technique of subject analysis, and so on. Such analytical and evaluative inquiry is open to anyone who has the necessary inclination, time, experience and imagination.
7. Somewhat more demanding in its materials is the statistical study of existing records—loan records, journal references, and the like. In such research, not only must the records be available—previously assembled for some other purposes—but some degree of ability in statistics is needed.
8. Many documentation questions, however, cannot be answered from existing records. Data must be collected before an analysis can be made—by questionnaires, interviews, the use of diaries, and so on. Such research requires the co-operation of many people and is accordingly slower and perhaps more costly. It almost inevitably needs institutional backing.
9. The most expensive type of research, which can only be carried out by an institution of some kind, is the experimental study to test the efficiency and cost of various alternative procedures or devices.
10. The aim of research in documentation is practical: it is to devise new methods of information transfer, and to provide information about effectiveness and cost—information on which decisions can be based.
11. The decision problems that an investigation aims to settle must be clearly stated. 'It would be of interest to know' is not an adequate statement of the purpose of an investigation.
12. The policy decisions envisaged must be ones that an existing or realizable authority could put into effect. It is pointless to formulate decisions that would have to be taken by authorities over whom one has no control or influence.
13. There are few central authorities in documentation. Most policy decisions can relate only to a small part of the whole system of information transfer. Research into documentation should in turn be concerned with well-defined and restricted problems having realizable solutions. Global surveys of the whole system rarely have any practical results.
14. Information from which no policy conclusions can be drawn is not worth collecting. In every case, the investigator must ask: 'If I had this information, could it affect policy?' The information will be useful only if the answer is 'Yes' or 'Yes, if further specified information is also collected'. In short, careful preliminary analysis is necessary in order to establish criteria—what characteristics of the situation are significant for decision.
15. Factual information is more useful than opinion. Opinions can be useful

if *a,* they adequately represent all potentially interested parties, and *b,* either they are knowledgeable or they can be checked against knowledge. If representative and knowledgeable about a situation, opinion can indicate a need for action to change the situation. If representative and checkable against knowledge, it can indicate the need for action to change current opinion. If these conditions do not hold, opinions are not a basis for decision.

16. The use of documents can be as uninformed as opinion about them. Failure to use a source may reflect ignorance of it. Information about use is therefore subject to the same limitations as is opinion. For example, a use survey may show that physicists do not use *Chemical Abstracts*. A literature survey may reveal information wanted by physicists in that journal. The non-use would then be uninformed.
17. Information may have both a local and a general import. It may consist of representative and knowledgeable local opinion or use that provides a basis for local decisions, while being generally unrepresentative and without validity for general policy. Equally, generally valid information may be inapplicable in particular local circumstances. The two aspects must be clearly distinguished by the investigator.
18. Information about a situation should only be broken down into classes to the extent that it is possible to envisage different actions with respect to each class. For example, differentiating users into age groups is valid only if a different policy is applicable to each group. On the other hand if a class is heterogeneous and action is only possible for each subclass, lack of subdivision will prevent action. For example, a general opinion that 'indexes are inadequate' can lead to no action, for indexes are so variable. The unit class must be that for which action can be envisaged.
19. A correlation between two factors in a situation is useful if *a,* the causal connection between the two is clear, and *b,* the causal factor can be controlled. Correlations between vague and uncontrollable factors are not a basis for decision. For example, the correlation 'methods of information search are influenced by working environment' can lead to no action unless *a,* we know the features of the environment that lead to effective information search, and *b,* we can alter environments.
20. Much care is necessary in formulating measures of the efficiency of any process of information transfer. The primary measure must be efficiency in terms of service to users. At any given level of service, the secondary measure is in terms of the cost of one procedure relative to another.

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DISCUSSION

The Chairman opened the discussion, saying he saw the information officer as a member of the research team, and the objectives of good information work as facilitating the objectives of the scientific team. The problems of information storage retrieval and use were part of the larger problem of the effectiveness of creative teams. There had been very little study of the nature of the 'creative environment'. It seemed certain that different types of information might be noted. There was perhaps 'administrative information' and 'scientific information', and it seemed probable that the optimum systems for information handling differed according to the type of information, and of course the type of information differed in terms of the different objectives of the organization. In the study of the information-gathering habits of scientists in the electronics field, he had been very surprised at how little information the majority were prepared to admit as necessary. The reading or scanning of journals was not rated as a task of high priority. The need for information was not realized. Information officers and directors of research might have their views as to what constituted information and how this related to the needs of the scientists with whom they were involved, but once one began to speak of 'needs' there was some implicit theory of 'deficiency'. Perhaps the majority of delinquents *needed* therapy, but the majority did not *want* it, and if it were given to them without option it was not usually regarded by them as 'therapeutic'. The borstal governor regarded the institutional setting as 'treatment', but most of the inmates regarded it (certainly at first) as 'doing their bird'! We could not lock scientists up for long enough for them to realize that the forced feeding of information in accord with our conception of their needs was really good for them. In any event, were we yet able to state a meaningful theory of deficiency to relate to our concepts of needs? (In the field of information, of course, not of borstal training.)

Perhaps we might begin by questioning what was 'information'. Was 'information' only information when the need for it was perceived by the user? Much could be done within this limited framework. One criterion for the efficiency of information work could be the degree to which what was defined to be required was provided within units of time. But a criterion of the success of any operation could, he thought, only be in terms of the degree to which what was attempted was achieved. The higher one set one's sights, the greater would be the number of deficiencies that would be noted. The question of when information was not information was a serious one. Some interesting and disturbing work had been done in the USA which threw light on this problem. Sociologists had studied how small groups, charged with solving problems, behaved under controlled conditions. The information necessary to solve the problems was shared among the problem solvers, so that all had to contribute. In some cases roughly equal amounts of information were given to all members, but in some other cases, otherwise exactly similar, one member of the group was given more information than the others. Thus was created in the laboratory situation the character termed in the technical literature the 'wise guy'. The efficiency of the different groups in solving the problems was the criterion. It was found that the groups where the information was shared around equally arrived at solutions more quickly and with far less tension than the groups where one member had more of the information. The information was the same information, but when it was received by the group through the medium of the 'wise guy' perfectly good information was rejected. In so far as we may regard information as that which helps to solve problems, information was in one set of conditions regarded as such, but in other conditions it was regarded as 'non-information'. Moreover, not only was the good information rejected, but the group tended also to reject the 'wise guy' in other roles within the group as well. Thus we may conclude that the 'channel' through which information is received adds or subtracts something from the information.

The Chairman had himself shown that after too much information had been fed to decision makers, the information proved to be dysfunctional in decision making. Very little excess information seemed to cause a phenomena which he would term 'information overload'. It was also shown that the sequence in which information was supplied to decision makers could change the type of decision they were likely to make—again where it was the same information and only the sequence of presentation was controlled. Was there an optimum way of programming information into human decision makers? Perhaps given certain sequences the human mind could retain and utilize more information than with other sequences?

It seemed clear that the ways in which the information officer was perceived—the perception of his role in the group situation was as important as any technical developments in information handling. It followed that if optimum use was to be made of any system any 'put away' language should be the language of retrieval. Did we know enough about the language of retrieval?

Social scientists had begun to study deviant human behaviour, but usually this deviant behaviour was behaviour which society had classified as 'bad'. It was, of course, important to study delinquents, but while the deviance of delinquents is harmful to society and we wish to modify their behaviour to inhibit the undesirable elements, the deviant behaviour of scientists is regarded by most people as useful for society. If social scientists could help in inhibiting dysfunctional human behaviour, could they not similarly be expected to help with functional human behaviour? It was time to move towards a science of science, and for the behavioural scientist to challenge the physical sciences with the human factors involved in the 'creative environment'. Could there not develop a 'science of administration of science'? Communication was the mechanism of social evolution; communication was information handling; the information officer was, by definition, in the business of communication. Was he satisfied if the customer received the package, or did he concern himself with his receipt of the 'message'? Was he content to sell his product only to the customers who clamour for it, or did he go in for market research? Did he meet only needs which were expressed in a language which was appropriate, or did he see it as part of his job to stimulate an awareness of needs? If the information officer had a concept of needs, had he a theory of deficiencies?

Mr V. T. H. Parry (Nature Conservancy) said he would like to remind the Conference of a very old and true saying—'You can lead a horse to water but you cannot make him drink'. Hence librarians could spoonfeed the scientist as much as they liked (as suggested by Mr Agard Evans that morning), or they could decide that the technologist needed to read more (Mr Vickery's paper), with no effect whatsoever—without the willingness and co-operation of the user! His was the ultimate responsibility in using literature effectively. It followed from that, that a healthy scepticism must be developed to research investigation in documentation; was it really necessary to prove statistically that one and one made two? There might be a kind of Parkinson's Law operating whereby research increased according to the money, time, and manpower available, rather than because of its inherent necessity and ultimate worth.

Mr A. J. Dickson (Ealing Technical College) said he thought the Cranfield experiment was useful not only in comparing classifications but in examining intellectual work in general. Even false drops could be stimulating in research work. The NLL survey of serials might well produce a 'half life table' of various periodicals. Effort could better be spent in co-ordinating existing research (e.g., linguistic data at Besançon University) than in encouraging new groups.

Mr J. Penny (Dounreay Experimental Reactor Establishment) observed that the Conference had been considering three different types of problem; these might be classed as mechanistic, humanistic and organistic. The mechanistic problems had been well covered, witness the admirable contribution of Mr Mills and other speakers. The humanistic problems had been discussed at length, but it was not really fruitful for Aslib or information workers in general to discuss in isolation the very complex problem of how one human being communicated with another. The Conference was not a competent body for the discussion of such humanistic problems, many other specialists were concerned there, and significant advances would only be made after full collaboration with these other specialists. That led naturally to the consideration of organistic problems, and there the Conference was competent to review and discuss fruitfully. By organistic problems he meant those associated with the organization of research and technological institutions. The information scientist was only one of a number of specialists whose services were required by, and were impinging upon the attention of, the creative scientists—humanistic ones. It was easy to identify the more specialist services: the accountants who required to know what research work was contemplated so that they could estimate expenditure; the safety specialists who required to know the details of an experiment to decide whether it would be safe to conduct; and the efficiency experts who with the tools of operational research such as Critical Path analyses, and PERT, were attempting to decide how experiments should be best placed in sequential order to obtain the best result in the minimum of time at minimum cost. These, together with the information scientist, formed what he would describe as an Advisory System to the management of scientific research; there were others demanding a hearing such as the personnel specialists. The Advisory System was growing and was intruding more and more into the field of operation of the creative scientist. More than that, each specialist service must be in competition one with the other for his attention which he was already reluctant to spare for other than his chosen work. It was for these reasons that Mr Penny suggested that the Conference could more fruitfully devote its attention to organizational problems. It should look at the size and scope of the Advisory System and seek optimum organizational patterns with the other specialist services to extract the maximum value of the necessarily short contact times that were available when dealing with the creative scientist. Mr Penny suggested that the Conference would be better advised to consider such concepts as that of a secretariat consisting of the important specialist service so that, say, the approach to a scientist with a particular piece of information could include the safety and efficiency aspects as well as the purely scientific, thus saving three separate approaches on the same topic by the three specialist services.

Mr F. Landmann (Watford College of Technology) thought that the Conference confirmed what he had suspected, i.e. that Aslib completely excluded from its investigations the *needs* of the scientists who were engaged in the Human Sciences. Those needs—if not the expressed demands—were urgent indeed, and he felt that Aslib should turn its attention to them.

Mr J. Farradane (Northampton College of Advanced Technology), speaking of the problem of completeness of abstracting, said that his own attempt to achieve completeness in the abstracts journal he used to produce had been based on the desirability of prestige. If a journal of world-wide distribution was going to be produced it ought to be as complete as possible, to satisfy customers. The criteria of completeness depended upon rigorous definition of the field to be covered; if a paper concerned the centrifuging of sugar, specifically mentioned, it could be included; but a paper on centrifuging design, even though obviously applicable to sugar, but not mentioning it, would be excluded. What could be done to reduce volume would be to exercise personal discretion by giving only a title or one line or two of abstract to papers considered of lesser value, and full abstracts to papers of apparent importance. Users of the journal could read 'between the lines' and appreciated the implied guidance to reading. Thus an attempt had been made to achieve a compromise between completeness and comparison.

Mr J. E. M. Lilley (International Computers and Tabulators Ltd) commented that in connection with abstracting or the publication of bulletins an Information Officer must first be guided by his own view of the requirements of the members of his organization. Having decided these he should then ascertain periodically that he was working on the right lines by asking for criticism and suggestions for improvement.

Mr J. P. Maule (Commonwealth Bureau of Animal Breeding and Genetics) said an abstracting service, such as that provided by the Commonwealth Agricultural Bureaux, must carefully define the field covered by a journal. Abstracts are invariably non-critical, but some indication of their value within the field was their length; in general it was probably true to say that foreign language papers were dealt with in greater length than most English language papers, which were more likely to be available to, and understandable by, scientists; furthermore, scientists should depend on abstract journals for sources of information in journals in unfamiliar languages.

Mr F. Liebesny (British Aluminium Co. Ltd) said that at the Aslib Brighton Conference (in 1956) the audience had resolved solemnly and unanimously that Aslib should conduct research in information work. Since then, Aslib—and apparently some thirty-six other bodies—had conducted numerous surveys and tests; had studied the scientist in his sleep, during his tea-break, and at his laboratory bench; had counted the number of foreign periodicals; had measured the length of abstracts, etc. In short, data had been amassed, but no one appeared to know what to do with it. Mr Liebesny therefore proposed calling a moratorium: during this no further data should be collected, but a start made on thinking what was to be done with what was already available.

Mr C. G. Wood (Royal College of Science and Technology, Glasgow), returning to the gist of the meeting, took issue with Mr Liebesny over the provision of data for research. More data was required, not less. Specifically he thought of the University Grants Committee which was responsible for collecting statistics on university and college libraries. They issued their Annual Report, and Table 14 provided, in the Appendices, certain figures on the individual libraries; these, he submitted, were not sufficiently detailed. For example, the expenditures on staff salaries should be presented as a percentage of each library's total expenditure. (This could be worked out, he knew, but it was an unnecessary chore, and the figures should be provided.) One would also like to know, say, how much library income was channelled into supporting departmental expenditure on books, periodicals, and binding: these analytical breakdowns were not available in Table 14. He felt that the Conference, as a representative body, might well make representations to the Committee to provide such expanded and relevant details.

Mr H. McCall (Marine Laboratory, Department of Agriculture and Fisheries for Scotland) said the Chairman's illustration of the reaction of a group to the 'wise guy' with more information than anyone else suggested to him that one of the factors in the problems before them was not only the frailty of human nature but the limits of the mental stamina of each individual. For example, possibly one reason why technologists read less than pure scientists was that they had more work to do each day and had not the mental energy left to absorb many new ideas. The same thing might be true for high ranking scientists compared with the lower ranks.

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MEMBERS' ADVERTISEMENTS

The charge for advertisements in these columns is 4*d* per word, minimum 5*s*. An additional charge of 6*d* is made for the use of a box number.

ABILITY AND SERVICE. Technical or commercial translations into/from Dutch and German. Speller-Kuijpers, FIL, NGV, 6 Lakeside, Ealing, London W13. ALPerton 1045.

TRANSLATIONS FROM TURKISH. All subjects. F. P. Scott, 4 Uphill Grove, Mill Hill, London NW7.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. STAmford Hill 8564.

Appointments vacant

The ATOMIC ENERGY RESEARCH ESTABLISHMENT invites applications for a post in the HARWELL LIBRARY. The duties of the post are to take charge of one of the three main Sections of the Library (the Cataloguing Room, the Reading Room, or the Report Room). A professional library qualification and experience of organization and staff management in a scientific or technical library are essential. Depending upon qualifications and experience, the salary will be within the range £1,250–£1,535 per annum. Superannuation scheme; housing purchase assistance. Please send a POSTCARD for application form to: Personnel Department (A5043/205), Atomic Energy Research Establishment, Harwell, Didcot, Berks.

BRITISH STANDARDS INSTITUTION. The British Standards Institution requires a Technical Officer for its Documentation Section. The work will be primarily concerned with the preparation of British Standards for bibliographical references, abbreviations for periodical titles, transliteration, and document reproduction, mainly in association with the International Organization for Standardization but also to assist in the completion of the English edition of the UDC. Applicants should preferably possess a working knowledge of French and be an ALA or have studied for this qualification. The starting salary will be dependent on age, qualifications and experience. The post is pensionable. Apply to the Establishment Officer, BSI, 2 Park Street, London W1, quoting reference (DOC) and giving a brief résumé of education, qualifications and experience.

COMMONWEALTH BUREAU of DAIRY SCIENCE and TECHNOLOGY, Shinfield, near Reading, Berks. SCIENTIFIC INFORMATION OFFICERS. Applications are invited for posts of Scientific Information Officer at this Bureau. Duties are mainly concerned with abstracting of the world's scientific and technological literature of dairying and related subjects for *Dairy Science Abstracts*. Applicants should preferably have a science degree (in dairying or a related branch of science) and/or knowledge of some foreign languages (preferably including Russian for one of the posts). Salary scale £791–£2,061. Starting salary according to age, qualifications and experience. Provision for superannuation. Applications with full particulars and names of at least two refereces should be submitted to the Director.

JUNIOR LIBRARY ASSISTANT with knowledge of typing, required by BORAX CONSOLIDATED LIMITED. Modern offices, close Victoria Station, five-day week. Free lunches. Please apply: Staff Manager, Borax House, Carlisle Place, London SW1.

LIBRARIAN. BRITISH EUROPEAN AIRWAYS require a Librarian at their Training Centre, near London Airport. Apart from the day-to-day running of the library, the duties include preparing training course material, analysing current trends in training literature and lecturing on supervisory and management courses. Applications are invited from male graduates aged 23 or over, with ALA or equivalent professional training and, preferably, teaching, lecturing or administrative experience. Salary scale £989 to £1,049 p.a. Detailed applications should be made to Personnel Officer (AP), Head Office, Bealine House, Ruislip, Middlesex.

URWICK, ORR & PARTNERS LTD, Management Consultants, seek a CATALOGUER for one year to re-classify the Library by UDC. Registration Group A, and ability to type are essential. Experience of Management or Economic literature would be helpful. Salary £780. Please write to the Librarian, Urwick Management Centre, Stoke Poges Lane, Slough, Bucks.

TECHNICAL TRANSLATION OFFICER. International association situated in South Sweden requires experienced technical translator. Candidate should be fluent in English and French, one of the two languages being the native tongue. Good knowledge of German desirable. Thorough familiarity with technical terminology, particularly building and civil engineering, essential. The person appointed, who should not be below thirty, will supervise work of other translators, as well as effect translations. The official language of the association is English, with French as a secondary working language. Applications giving full details of qualifications and experience, salary required and other customary information should be addressed to CEMBUREAU, The Cement Statistical and Technical Association, P.O. Box 245, Malmö 1, Sweden.

D.S.I.R. BUILDING RESEARCH STATION, Garston, Watford, Herts.
ASSISTANT EXPERIMENTAL OFFICER /EXPERIMENTAL OFFICER as technical translator/abstractor of technical literature dealing with wide range of subjects in building science and technology.
QUALIFICATIONS: Science degree, H.N.C., Dip.Tech. or equivalent; intelligent interest in information work; sound knowledge of at least two foreign languages required; one Scandinavian language an advantage. Opportunity for further language study.
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APPLICATION FORM from Director at above address quoting reference E/AF/068. Closing date 26th February 1964.

WOOLWICH POLYTECHNIC, London, S.E.18. LIBRARIAN (Grade III) CATALOGUER. Applications are invited from graduates with professional qualifications for this new post in a rapidly developing library. The person appointed will be responsible for classification and cataloguing; the stock is at present being re-classified according to UDC and re-catalogued. The College offers courses for first and higher degrees of the University of London and Diplomas in Technology; the Library therefore contains much literature in higher specialized scientific fields to meet the needs not only of undergraduates but of postgraduate students and research workers. The duties would also include some help with reference and information work. Salary scale: £910 × £45–£1,225. Particulars and application form from Clerk to the Governors, to be returned by 20th February 1964.

WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE. Applications are invited for a post as a Librarian in the College Library Service. Candidates should have passed the Registration examination of the Library Association and should preferably be Chartered Librarians. Salary scale £870–£1,125 p.a. Further particulars and application form will be sent by the undersigned. Applications should be received by 6th March, 1964. E. C. SMITH, Principal.

LIBRARY ASSISTANT required, primarily to assist in the compilation of card indexes. Some knowledge of languages and of chemistry (e.g. to O level G.C.E.) an advantage. Previous experience of library work not essential but the position offers a good opening for anyone interested in embarking on a career in this field. Applicants should apply in writing to the Paint Research Station, Waldegrave Road, Teddington, Middlesex.

ASSISTANT required in Library to undertake the preparation and editing of abstracts. Permanent post, hours 9.15 a.m. to 5.15 p.m. Monday to Friday. Salary scale £600 to £780. Applications stating qualifications and experience to The Secretary, Timber Research and Development Association, St John's Road, Tyler's Green, Penn, High Wycombe, Bucks.

Wanted

METALLURGIA—July, 1954; Jan., 1956. Also any indexes between 1948 and 1959. Offers to Technical Librarian, Guest Keen Iron & Steel Works, East Moors, Cardiff.

BEILSTEIN, Landolt-Boernstein, Houben-Weyl, Elsevier's Encyclopaedia—odd volumes or part-sets covering years 1948–59. Offers to Box No. 364, Aslib.

AMERICAN DOCUMENTATION, vol.10, nos.1–4; vol.11, nos.1, 3 and 4; vol.13, nos.3 and 4. ASLIB PROCEEDINGS, vol.5, nos. 2 and 3; vol.7, nos.1 and 2; vol.9, no.2 (two copies). JOURNAL OF DOCUMENTATION, vol.11, no.3; vol.12, no.1; vol.13, nos.1 and 4. REVUE DE LA DOCUMENTATION, vols.21–27; vol.26, no.1; vol.28, no.1. UNESCO BULLETIN FOR LIBRARIES, vol.10, nos.4–10; vol.11, no.1; vol.12, no.4; vol.14, no.4; vol.15, no.1; vol.16, no.2. ASLIB LIBRARY.

Aslib Proceedings

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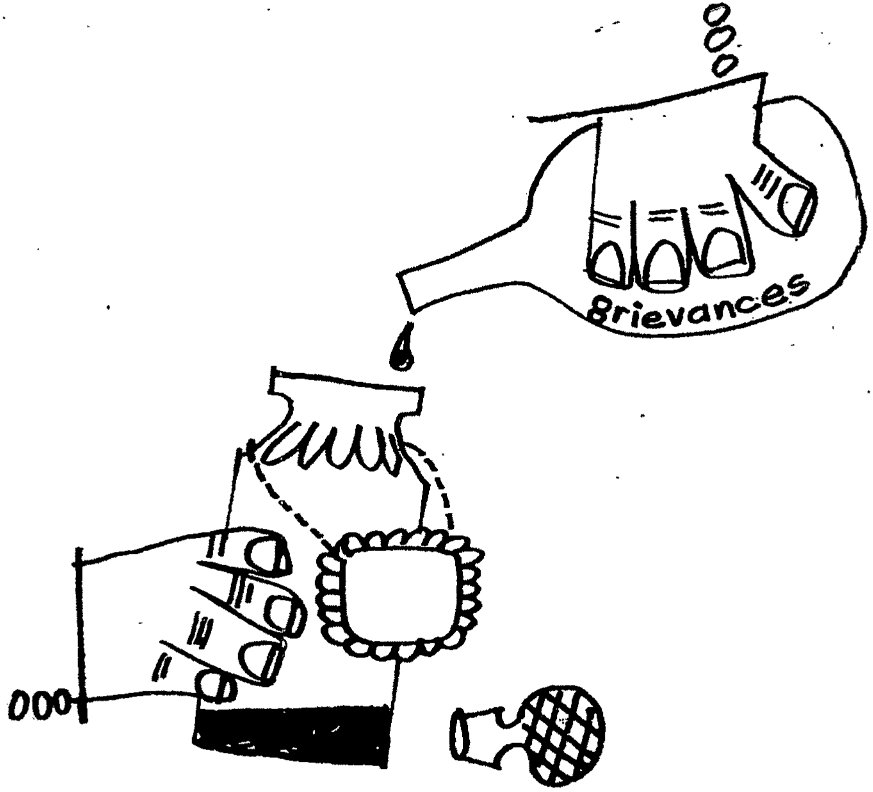

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Volume 16 **March 1964** **Number 3**

ASLIB CALENDAR 1964

March

FRI.20. Scottish Branch annual general meeting and one-day conference, Glasgow.

WED.25. Evening meeting at Aslib, 5 for 5.30 p.m. 'The new BUCOP', by K. I. Porter.

April

WED.1. Film Libraries Group annual general meeting at Shell Centre, 6.30 for 6.45 p.m. See paragraph below.

WED.8. Aslib conference on feature card indexing. Programmes and application forms available.

WED.8. Transport Group meeting at Institute of Transport, 2.30 p.m. See paragraph below.

THUR.9 – SAT.11. Aeronautical Group and Chemical Group joint annual conference at Cranfield.

WED.15. Scottish Branch visit to Wm. Collins & Sons.

FRI.17 – SUN.19. Midlands Branch conference at Oxford, 'Educating the user'.

WED.22. Evening meeting at Aslib, 5 for 5.30 p.m. 'Taking stock—a fresh look at education for special librarians', by Jack Bird. See paragraph below.

THUR.23 – SAT.25. Northern Branch conference at Southport. See paragraph below.

May

MON.4 – FRI.8. Senior introductory course to special library and information work. See paragraph below.

WED.20. Evening meeting at Aslib, 5 for 5.30 p.m. 'O & M in the special library', by E. H. E. Jones.

SAT.23 – SUN.24. Engineering Group conference at Leamington Spa.

TUE.26. Advanced course on patents.

June

TUE.2. Evening meeting at Aslib, 5 for 5.30 p.m. 'How to be an expert overseas', by B. Agard Evans, O.B.E.

FRI.5 – SUN.7. Electronics Group annual conference at Ashridge College. See paragraph below.

Aslib evening meeting

At the April meeting Mr Jack Bird, M.A., F.L.A., Education Officer of Aslib, will speak on 'Taking stock—a fresh look at education for special librarians in an age of expansion'. The Chair will be taken by Mr L. G. Patrick, F.L.A., Librarian, Aluminium Laboratories Ltd. The meeting will be held on Wednesday 22nd April at 3 Belgrave Square at 5.30 p.m. Tea will be served at 5 o'clock.

Seldom before has the problem of education for special librarians been such an urgent issue. New developments are occurring with such rapidity that it is difficult for the practising librarian to keep up with them. The new examination structure of the Library Association—still incomplete—and the teaching arrangements which have been developed to cater for it have called forth many protests from special librarians, particularly because it is felt that they do not meet the needs of the staff of small libraries and new libraries in firms and similar organizations.

Mr Bird believes that the details of the problem cannot satisfactorily be solved unless they are seen in perspective as part of the whole. The spread of information services through industry and into other fields, and the expansion of higher education proposed in the Robbins report, will have an effect on the demand for trained library and information staff. This effect, which has not yet been estimated, should be taken into account in any plans that are made now. In the light of these developments there are a number of questions which require a fresh examination: the relationship between education for librarians and education for information officers, the interaction between these and other disciplines, the role of the universities in education in library and information work, the organization and content of training for sub-professional workers in special libraries and information departments.

In considering these questions Mr Bird will be using material collected by Aslib in a survey conducted during the past year, as well as results of other surveys communicated to him. He will also make reference to parallel matters in other countries. Because of rapid developments in the field the lecture will of necessity be an interim report, but it is hoped that it will stimulate some fresh thinking on these subjects.

Senior Introductory Course to Special Library and Information Work

A senior introductory course to special library and information work will be held at Aslib from Monday 4th to Friday 8th May. It is intended for people holding a university degree or similar qualification who have recently started work in an information department or special library, also for those with experience in other fields who come into senior posts in information departments or libraries without previous experience of the work. The course will teach the principles governing the production and handling of information, and some of the practical details of running an information department or special library. Visits to libraries and information departments are included in the programme and time is allowed for discussion. The fee for the course will be £10.

A programme and application form are enclosed in this issue, and intending students are advised to apply early. Provisional bookings will be accepted by telephone or telex. As a general rule, only students possessing a degree or equivalent qualification will be accepted for this course, but Aslib will be prepared to consider special circumstances. Anyone who is uncertain if the course will be suitable for him or for her should consult the Education Officer, Mr Bird, before applying.

Northern Branch

A Spring Conference is to be held by the Northern Branch, in Southport, from Thursday 23rd to Saturday 25th April. Full details will be circularized to members of the Branch.

Electronics Group

The sixth Annual Conference of the Electronics Group will take place from Friday 5th to Sunday 7th June and will again be held at Ashridge College, Berkhamsted. The conference will open on the Friday evening with a talk and demonstration on 'Stereophonic sound' by Dr D. M. Manley of Hendon College of Technology. There will be two main sessions: one on 'Computers, mechanization and documentation' at which Dr M. P. Barnett of the Computing Laboratory, Massachusetts Institute of Technology and Mr H. F. Vessey of Technical Information and Library Services (TIL), Ministry of Aviation will be the speakers; and one on 'Indexing and information retrieval' in which KWIC, UDC, co-ordinate indexing, facet and alphabetical systems will be discussed, in a series of five short papers by users of each system. A paper on plasma physics has been promised by Mr P. A. H. Saunders of the Culham Laboratory, United Kingdom Atomic Energy Authority. A visit to Hatfield College of Technology to see its methods of documentary reproduction and the library of the college, and to hear something of the industrial library service HERTIS, is arranged for the Saturday afternoon.

The full programme will be available in April. Anyone requiring further information should get in touch with the Conference Secretary, Mr R. S. Lawrie, Chief Librarian, Sperry Gyroscope Company Limited, Downshire Way, Bracknell, Berkshire.

Film Libraries Group

The Annual General Meeting of the Group will be held on Wednesday 1st April at 6.30 for 6.45 p.m., in the Small Cinema at Shell Centre, Waterloo, London SE1. The meeting will be followed by a showing of the film *Whisky Galore*. Further information may be obtained from the Hon. Secretary of the Group, Mrs Anne Hanford, at BBC TV Film Studios, Ealing Green, W5.

Transport Group

An application for permission to form a Transport Group is at present being submitted for consideration by the Aslib Council. All Aslib members interested in the transport field will be very welcome to join. A preliminary meeting was held on 21st January, which over thirty members attended, and a programme of work was formulated. Initially, steps are being taken to ascertain the publications distributed by the members of the Group, in order to facilitate exchange of items. The next meeting will be held on Wednesday 8th April at 2.30 p.m., at the Institute of Transport, 80 Portland Place, London W1. Requests to join the Group are cordially invited, and should be addressed to the Liaison Officer at Aslib.

Literature Searching by Research Scientists

The *Report of an investigation on literature searching by research scientists* is now available from Aslib. This is a factual report of work recently completed by the Aslib Research Department and includes all the results which were of value; only such discussion is included as is necessary to clarify the data.

A sample of more than six hundred scientists—chemists, physicists, psychologists, mathematicians, and biologists—employed in industrial, academic, and government research was investigated. The report shows the extent to which scientists search the literature, and how often published information is found too late to be of value. This is thought to be the first quantitative assessment of the effect of inadequate literature consultation, and of the frequency with which duplication of research, or waste of research effort, time or money is discovered.

Copies of the report are available from Aslib, price 7*s* 6*d* each plus postage, and an order form is enclosed with this issue of *Aslib Proceedings*.

An article discussing the economic implications of the findings relating to duplication has appeared in the *New Scientist* for 6th February 1964 and reprints are available free to members on application to Aslib. A further paper, considering the significance of the results as a whole, will appear shortly, probably in a library journal; details will be given in a later issue of *Aslib Proceedings*.

Cumulative Index to *The Engineer*

A cumulative index covering volumes 1 to 208 of *The Engineer* has recently been published. There is an extensive name index which includes entries for places and firms. Reference is to volume and a simple page number only, but the year/volume relationship is summarized as a running footnote. The subject index is restricted to a list of references under each heading and would be tedious to use for many subjects which have over twenty undifferentiated entries. There is a useful list of locations throughout the world for complete files of *The Engineer*. *'The Engineer' index 1856–1959* is published by Morgan Brothers, price £8 ($23) including postage. Inquiries should be sent to the Circulation Manager, The Engineer, 28 Essex Street, Strand, London WC2.

New Commonwealth Bibliography

The first issue of *Technical Co-operation; a monthly bibliography* has just been produced by the Library of the Department of Technical Co-operation. It consists mainly of lists of the official publications of Commonwealth countries, arranged by region, but also includes reports and bulletins relating to administration overseas. There is a useful section on new maps received in the Directorate of Overseas Surveys. The bibliography, which is free of charge, may be requested from the Librarian, Department of Technical Co-operation, Eland House, Stag Place, London SW1 (telephone Victoria 2377).

Commercial Information for Management

The British Institute of Management has just issued no. 110 in its *Information summary* series. This is entitled *Commercial information for management* and analyses the discussions and conclusions of the BIM seminars on this theme (see *Aslib Proceedings*, vol. 15, no. 8, August 1963, p. 225–6). The summary is only available to collective subscribers to the BIM and inquiries should be directed to the British Institute of Management, 80 Fetter Lane, London EC4.

Grant to National Book League

The National Book League has received a grant from the Nuffield Provincial Hospitals Trust, to investigate existing library facilities in hospitals and medical schools, and the supply of medical books and journals to all working in medicine.

From this investigation the League will probably make recommendations for improvement in the flow of information within the Health Service. Requests for further information should be made direct to the National Book League, 7 Albemarle Street, London W1.

Commercial Library Guide

The second edition of a pamphlet *Commercial information: a guide to the commercial library*, by Mr A. L. Smyth, F.L.A., has recently been issued by the Manchester Public Libraries. It is aimed to provide business men with a summary of the principal categories of published material of value to them and to indicate the commercial information available in the Library. Topics dealt with include company information, trade-marks, and export services. Copies are available from the Commercial Library, Central Library, Manchester 2, price 2*s* 6*d* post free.

NEW MEMBERS

CORPORATE

Name	*Locality*	*Representative*
Amalgamated Asphalte Companies Ltd	London	D. F. Wood
Athens Center of Ekistics	Greece	Dr D. Iatridis
Cornbrook Resin Co. Ltd	Lancashire	A. J. Borin
Coventry Technical College	Warwickshire	N. Kerrod
Holland & Hannen & Cubitts Ltd	London	W. Sekules
Immaculate Heart College	USA	Sister Mary Lucille
India. Central Food Technological Research Institute	India	Librarian
Iranian Oil Services Ltd	London	Technical Librarian
Jersey Public Library	Jersey	J. F. Yeates

Name	*Locality*	*Representative*
Lancaster & Morecambe College of Further Education	Lancashire	G. Hollingshead
National Union of Students	London	H. F. P. Wetherell
Nitrovit Ltd	Yorkshire	K. George
North Berkshire College of Further Education	Berkshire	A. J. Clark
Sanders (Electronics) Ltd, W. H.	Hertfordshire	J. Fairhurst

INDIVIDUAL

Name	*Locality*
Bull, G. A.	Berkshire
Cameron, A.	Berkshire
Hocking, Miss Katherine	Devonshire
Merrick, Colonel R. H.	USA
Moore, R. J.	London
Taylor, Miss Denise	Hertfordshire
Wood, A. J.	Lancashire
Young, Miss Margaret G.	London

CHALLENGE AND OPPORTUNITY: SHEFFIELD'S NEW POSTGRADUATE LIBRARY SCHOOL

W. L. SAUNDERS, M.A., F.L.A.
Director, Sheffield Postgraduate School of Librarianship

Chairman, D. J. Foskett, M.A., F.L.A., Librarian, Institute of Education, University of London

Evening meeting, London, 21st January 1964

IT may seem faintly ridiculous to speak of the history of a teaching institution that has yet to receive its first students, but over the last forty years the idea of a second Postgraduate School of Librarianship has been a gleam in many a professional eye—a gleam that at times flickered and almost died, but which revived and glowed brightly with the suggestion in 1960 that the University of Sheffield should be asked if it would consider establishing such a school.

The proposal came from the Library Association and it is my dear wish that one day I shall know the full story of the background to it; of the discussions that culminated in a semi-official visit from Mr B. S. Page, Librarian of the University of Leeds, and at that time President of the Library Association, to Mr J. E. Tolson, Sheffield's University Librarian. Mr Page put the Library Association's proposal to Mr Tolson, who wasted no time in seeking the views of the Vice-Chancellor and influential academic colleagues. It is interesting to record that never was the slightest doubt expressed about the 'academic respectability' of librarianship, or whether it was a proper subject of study for a university; and one cannot but wonder whether this ancient bogey may largely be one that we librarians have created for ourselves. Indeed, the reaction at Sheffield to the idea of a Postgraduate School of Librarianship was uniformly favourable; the addition to our student numbers of a select group of good graduates, drawn from many universities, was thought to be a most desirable form of university expansion.

As a result of these informal soundings by Mr Tolson Mr Page was invited to send a letter to the Vice-Chancellor in which the proposals were given formal expression. This letter was presented to the University Senate in the autumn of 1960. Senate set up a small working party to consider the proposal in more detail and to advise on its financial implications. The report of this working party, after acceptance by the University, was presented to the University Grants Committee on its quinquennial visitation in May 1961. It was clear that the proposal engaged their sympathetic interest, and we have subsequently had evidence of this in the form of a substantial capital grant for improving the Library's holdings of librarianship literature and a large grant for the conversion and furnishing of the house the School is to occupy. Before this stage was reached, however, support was offered from another and most welcome direction when the Sheffield Town Trustees, an important local trust, offered £2,000 a year for five years towards the creation of the School. With this most tangible evidence of 'town' goodwill in support of the University's own determination to press on with the new development, the project began to take firm shape, and if the School cannot properly claim to be 'off the ground' until its first students arrive, it was at least approaching the 'pad' when the stage was reached in 1962 of advertising for a Director. I took up this post in April 1963 and quickly received evidence of the University's goodwill towards the School. At that time the universities were experiencing the less favourable swing of the 'boom or bust' cycle which characterizes the Exchequer's approach to university finance, but Sheffield University's Policy Committee deployed in my direction a high proportion of the slender resources then available for new posts in 1963–4, and agreed to my request for three full-time and several part-time lecturers, the appointments to be made in good time for the School to open its doors in October 1964. Further, the University had purchased for the School a handsome house, very suitable for our needs, and only a few minutes from the main University building and the Library.

When I consider our assets, then, I have every reason for satisfaction and at this point I might mention what is perhaps our greatest advantage of all, the library resources of Sheffield and district. We have in Sheffield one of the finest, if not the finest, university library buildings in the country, housing first-class and rapidly growing collections over a very wide range of university studies. We have a justly famous public library system, whose Chief Librarian is offering the fullest possible co-operation with the School. Through the Science and Commerce Department of the Public Library is organized SINTO, the original pioneer of co-operative information work, which brings together the group of scientific and industrial libraries that make Sheffield one of the country's great centres in the field of special library and information work. On our doorstep are the libraries of great houses such as Chatsworth; and Leeds and Manchester are no farther from Sheffield than one extreme of Greater London is from the other. Not far away, at Boston Spa, are the immense resources and tremendous potential for library research and innovation of the National Lending Library for Science and Technology, with which we have already established close contact, and whose Director and staff are sparing no pains to help and co-operate in every possible way. In such an environment a school of librarianship must surely flourish; and further, it seems plain that in one particular area—training in scientific and industrial librarianship and information work—we are perhaps in a uniquely favourable position for specialization. I shall say more of this later.

I call this paper 'Opportunity and Challenge'. It must be apparent that a wonderful 'opportunity' is ours. The 'challenge' is how to make full use of it, and I want now to say something of what we have done so far and what we are planning for the future. When I was appointed my first reaction, as a good librarian, was to go to the literature; and, better still, consult the specialists. Foremost amongst the latter were Professor Irwin, Mr Staveley and the staff of the University College London School of Librarianship and Archives, and I would like to take this opportunity of acknowledging the splendid assistance and practical advice I have received from them and indeed from many other experienced colleagues in schools of librarianship. As a practitioner of over twenty years' standing, it seemed obvious to me that I should also approach my fellow-librarians and ask them what they would be expecting and looking for from a school such as ours. During my first term as Director I had discussions with individual city and university librarians; I was able to attend a full meeting of SCONUL and hear the views of university and national librarians; I met representatives of the Circle of State Librarians; I visited special libraries and I had discussions with Mr Palmer of the Library Association and with Mr Wilson and Mr Bird at Aslib. This exercise in consumer research was most valuable, and I was able to supplement it in most splendid fashion during my second term by making an extensive tour of US Graduate Library Schools. The Leverhulme Trust Fund provided the money for this trip, and, grateful as I was for their financial backing, I was equally delighted by such evidence of faith and interest in our School. The USA has a long tradition of education for librarianship at graduate level, and a great range of university schools of librarianship. I visited twelve of these, extending geographically from UCLA and Berkeley on the Pacific coast to Columbia and Rutgers in the East; and I also visited the Library of Congress and the National Library of Medicine at Washington, the John Crerar Library in Chicago and many other great libraries. It is only a few weeks since I returned, so that I have still to get the American educational scene fully into perspective, but I already realize that my tour has crystallized many half-formulated ideas and introduced me to new implications and aspects of the professional education of graduate librarians.

During my travels I concerned myself with every manifestation of professional activity that came my way, always trying to relate it to the fundamental aims and objectives of a school such as ours. What in fact are these aims and objectives? Part of the answer began to appear when I tried to distinguish the special features of a postgraduate school of librarianship in a university, the features that make its problems and opportunities different from those of our other schools of librarianship; and I do not simply mean that a school such as ours has its own examination syllabus and conducts its own examinations.

First of all, let us look at the sort of student we shall get. Our normal entrance requirements are a good degree, a year's experience in a library, and a reading knowledge of two modern languages. This means that we should be able to presuppose considerable academic and personal maturity and a knowledge of the 'grammar' of librarianship; in fact a homogeneous group, all at the same stage of professional and academic development. We should be able to help them enlarge and enrich the specialized subject knowledge which they possess when they come to us, by introducing them to bibliographical skills; and they should be competent to range freely and comparatively unencumbered by language barriers over the breadth and depth of the fields in which they are working. They should be capable of some independent work under broad supervision, and indeed we propose to provide an outlet of this sort by making a long-term project in some area of librarianship an important part of the course.

The composition of the student group, then, is one distinctive feature of our School. The other is that it is part of a university, with all that this implies. It means first of all that, as of right, the students have access to a great library and its resources, and it will be our business to see that they use it to the full, that it is in fact their 'laboratory'. Secondly, it means that we shall be one of many university departments, each with its teaching responsibilities, each with its antennae sensitively attuned to new developments in its particular field, whether it be romance languages or electronics, and each making its own contribution to extending the boundaries of knowledge. Cross-fertilization between disciplines occurs spontaneously and probably unconsciously in an atmosphere such as this, and a new department becomes involved in the process virtually from the time it is created. In our case we shall be more exposed to such influences than most, as our department will not be a member of one particular faculty. I did not wish the School to be identified with the arts, with science or with any particular field of study: I feel we are involved in them all. Instead of a faculty, the School has an advisory committee through which it is answerable to Senate.

I might mention at this point that one of the features of the American scene which most impressed me was the extent to which Graduate Library Schools use courses conducted by other university departments. Drexel's Information Science course is nourished from their Colleges of Business Administration and Engineering, amongst others; Columbia students can take Descriptive Bibliography in the Graduate Faculty of English; Michigan *insists* on two courses in other graduate departments; and so on. I have every intention of adapting this principle for our own use at Sheffield: the Computer Laboratory, the Department of Public Administration and the Department of Business Studies come to mind immediately as possibly having contributions to make to our programmes. At a different level we might well bring in colleagues from other disciplines to introduce our students to the concepts, aims and objectives, and research methods of their particular fields.

The third distinctive feature of a university setting is that a university department is occupied with research as well as with teaching. It is axiomatic that this teaching will not remain alive, will turn barrenly inwards on itself, if its staff are not in some degree engaged in extending the frontiers of knowledge in their fields. It is my hope and intention that once our initial teething problems are out of the way we shall become actively involved in research in the fields of librarianship and information work; that we shall be able to offer facilities for research students, with possibilities of working for higher degrees; and that senior workers in our field might come to us, perhaps on research fellowships, and possibly do a little teaching, as is the case in some of the American Graduate Schools. If I judge the present climate correctly I feel that financial support for sound research projects in librarianship and information work would not be hard to find in this country, and when I visited Mr Clapp, Director of the Council on Library Resources in Washington, he assured me that suitable research proposals from our School would always receive sympathetic consideration from CLR.

A by-product of research would be the encouragement of another type of activity that I hope will become a regular feature of our School's operations. This is the organization of seminars, workshops, institutes, call them what you will, at which middle-rank or senior members of our profession could meet to study and discuss particular problems; perhaps as refresher courses, perhaps as introductions to new developments in certain areas. I feel there is a great need for a facility such as this; a means by which experienced practitioners can be brought together for a few days or even a few weeks, away from the daily hurly-burly, to share their ideas and experience in relative detachment and to consider important professional problems.

I have mentioned and enlarged on some distinctive characteristics of a University Postgraduate School. It follows from what I have said that a prerequisite for the successful operation of such a school must be a first-class staff, eager to engage in research and teaching, and with successful professional experience at senior level behind them. It has not been easy to find such people, particularly as we have laid great emphasis on foreign language competence in addition to all the other virtues. Our appointments have taken longer than I expected but we have been very fortunate, and I shall enjoy the support of colleagues known and respected throughout their branches of the profession. In addition we shall call upon part-time lecturers for certain specializations and I attach the greatest importance to this sort of contact with practising librarians. Our students will benefit tremendously from being in touch with people who are coming to give their lectures fresh from their libraries, and it is especially encouraging in this respect to know that Dr Urquhart has promised the fullest possible support from the National Lending Library for Science and Technology.

By now I have at least indicated the background against which my plans for the School have been developing. It is time to be a little more specific about the aims of our course and the means by which we hope to attain them. Our general objective is that students should emerge from their year at Sheffield with a sufficiently sound grasp of general principles and essential techniques to be acceptable members of staff in any kind of library; moreover, that any of our diplomates should feel able to move from one field of librarianship to another, completely different. We hope that the combined breadth and depth of our course will make this possible.

At this stage I cannot take you through our syllabus in detail because we are still working on it and it has yet to be submitted to my Advisory Committee and the University Senate. What I might usefully do, however, is indicate its general composition and mention in rather more detail a few of its special features.

There are some areas which we regard as being fundamental to any branch of library work, or as being of such very great value by way of general background that we shall expect all students to cover them. These required courses will include a survey of the library scene in this country, and its recent history, together with the principal professional and co-operative organizations and agencies at local, national, and international level. In addition, all students will do a course on reference work and materials, which will introduce them to outstanding bibliographical and reference sources in all branches of knowledge;

and I feel strongly that this must include a very thorough grounding in government publications and the publications of international organizations. There will probably be a required course on Library Management and Organization, and there will be an introductory course on Cataloguing and Classification. In addition we should like to introduce all students to what might roughly be termed mechanization and computer applications. This has relevance to at least two of the core courses I have just mentioned and also to some of our optional courses. It might be worth saying a little about this proposal, as it is perhaps one of the more unusual features of our programme.

I went to the USA knowing very little about data processing and information retrieval, and I hasten to add that I still know very little; but I accumulated great quantities of documents, references, and information (which I am still trying to digest), and I detected one or two trends that seem to me to be quite significant. First of all, the very big university libraries are giving serious attention to the question of internal data processing. For example, a programme is under way at the Illinois Undergraduate Library at Navy Pier, Chicago, where they are carrying out a large-scale investigation of computer applications to library processes. Mechanization has been introduced into certain acquisitions processes and into serials and payments records at Berkeley, and the point was made there that mechanization can save not only staff and time but space too; at UCLA three members of staff have attended IBM courses and one of them has responsibility for the whole question of mechanization. At Urbana a full-time member of the Statistical Service Unit is giving his attention to library mechanization; and so on.

This sort of thinking is becoming increasingly important in libraries where annual additions may be around 100,000 volumes a year (and UCLA has announced its intention of adding 1½ million in the next decade); in libraries which may require staff of two or three or more hundreds to run them; and in this latter connection I should mention that the problem is aggravated in America by a really desperate shortage of professional librarians. Our British university libraries are not yet approaching this scale of operations, but if the UGC Committee on University Libraries, sitting at present, recommend great increases in expenditure—and surely they must—and if the Robbins proposals make universities of ten thousand a commonplace, then the libraries in which many of our students will spend the greater part of their working lives may have more in common with Ann Arbor or Illinois than with present-day Sheffield or Manchester.

My impression in America was that computers were regarded at present as being much more applicable to data processing than to information retrieval—in other words, as being a tool of administration, just as they are in banking, insurance, and many other branches of commerce and industry. This is not to minimize the very important work being carried out in the field of information retrieval. I was most impressed by Western Reserve's excursions into information retrieval in the Social Sciences, and I was also fascinated to hear of the plans at Pittsburgh for developing a Knowledge Availability Systems Center under Mr Allen Kent, though this Pittsburgh centre will cover a broader field of activity than information retrieval alone.

Perhaps my most significant experience of all, in this area of work, was the morning I spent with the new Dean of the Chicago Graduate Library School, Professor Don Swanson. Until recently Professor Swanson was an electronics engineer, directing research on computers, and it was as such that he was a leading member of the committee set up to consider the full automation of the Library of Congress. With his recent appointment to Chicago comes a very interesting new approach to the problems of education for librarianship. His course on Library Systems Analysis is, I gather, required of all students for the Master's degree. When I asked how those with mathematical blind spots coped with the mathematics he sometimes had to introduce, he told me that he didn't believe in such things and quoted approvingly an English writer's views on numeracy ranking in importance with literacy. He is also planning a Doctor's degree course in information sciences, which is intended to produce advanced research workers rather than staff for libraries. Further developments in Chicago will obviously be well worth watching.

I might mention, incidentally, that one very important by-product of the movement towards data processing in big libraries has been that chief librarians have been taking a much closer look at the present deployment of their professional staff and the methods used in particular processes; sometimes, indeed, going on to question the very need for some of the processes. As one who trained as an economist, I warm to this approach and wonder if the services, perhaps part-time, of a tame economist or, better still, a cost accountant are not perhaps essential for any library organization over a certain size.

Turning from mechanization and computers, at the other extreme we shall hope in Sheffield before too long, if not immediately, to offer a course, or courses, with an eye to the special needs of the small library. The one- or two- or three-man band is very common in our profession, but comparatively little account has been taken of the distinctive needs of this sort of organization; of the problems, for example, of tutor-librarians, of librarians in small training colleges, colleges of commerce and technology, institutes of education.

Let me now say a little about the background to another of our courses, Subject Bibliography.

One of the most rewarding features of public library work is that the librarian has the opportunity to select books and so to make a personal contribution to the building up of his own library. This is also the case in many special libraries, and I know from personal experience that one of the delights of special librarianship is the ever-increasing feeling of mastery over the bibliography and literature of one's particular field. In some special libraries such mastery finds expression in systematic and informed book selection; the creation of libraries that include not only the obvious material but the recondite, even at times the near-ephemeral, that add depth and power, that begin to transform a good collection into a great collection. In other special libraries collection-building is less important and the librarian's bibliographical expertise finds its principal outlet in information work; but be that as it may, there is a sort of knowledge, an amalgam of bibliography and subject knowledge, which is of the essence of librarianship and which most public and special librarians can hope to apply in their daily work.

In university libraries, however, the scope for this particular sort of scholarship or skill is more limited. There is little reference work and generally most of the book selection is carried out by the teaching staff. Even where there is a more favourable attitude to the practice of book selection by senior members of the library staff the amount of time that they can spare for this purpose from their other duties is quite inadequate. For some time now, though, a distinct change of attitude towards this whole question has been discernible and a number of university librarians for whom I have a very great respect are thinking in terms of much greater participation by their staffs in the expansion and development of their collections. The older attitude that most of the book selection had to be in the hands of teaching staff was probably the outcome of very small book funds having to be strictly shared around the subjects, to ensure that every teaching department was able to buy at least some of the books it wanted. With larger funds more flexibility is possible, and I saw this very clearly illustrated in the great US university libraries, where on more than one occasion I was told by university librarians that they are now spending such large sums of money on their collections each year that individual teaching departments could not cope with the amount of work involved in building up their subjects in the library, and thankfully handed the task over to the librarians.

This presupposes, of course, that the library has enough staff—enough properly qualified staff—to be able to assume these very considerable responsibilities. A pointer to things to come may be UCLA's plans for eight bibliographers, senior members of the library staff whose exclusive concern is with building up the library's collections, each with responsibility for either a geographical or a subject area. What a wonderfully satisfying outlet this offers for the combination of subject and bibliographical scholarship that the best librarians aspire to.

With considerations such as these in mind, we intend to lay special emphasis from the very beginning on subject bibliography. In addition to the basic course on reference and bibliographical sources our students will specialize in the literature and bibliography of at least one particular area of study. For instance, there will be a course on the Literature of Science and Technology, another on the Literature of the Humanities, and another on the Literature of the Social Sciences.

The special characteristics of the chosen fields will be studied with the object of understanding the attitudes, aims, and research methods of those working in them and, above all, of appreciating their special requirements in terms of library materials and service. Particular attention will be paid to the great series and standard works and authors of the chosen field, including non-English language material, and to developing a sound knowledge of the specialized bibliographical apparatus and periodical literature that are essential to informed collection-building and book selection. Clearly there is a limit to the range of subjects over which a student could operate with this degree of intensity and there may have to be different levels of specialization. For example, someone who elects to study the literature of the social sciences might concentrate his greatest efforts on sociology and really get into the corners of this one subject, while specializing to a lesser degree in the other social sciences such as economics and political philosophy.

By now I have drawn attention to some features of our course that seem to me to be of more than usual interest, but I realize that the aspect of our activities which has most significance for this audience is our programme for industrial and scientific librarianship and information work.

We hope that graduates in science and technology will come forward in increasing numbers to do this course. It will be firmly based on our core subjects, but will permit students to give the greater part of their time to a programme tailored to their specialized needs. One of our three full-time lecturers will be a science graduate with extensive background in scientific and industrial library work, and he will be supported by such visiting specialist lecturers as may be required. I know, too, that these activities will have the sympathetic interest and attention of the University's departments of pure and applied science and that we shall be able to count on their co-operation to any reasonable extent that may be required.

The course on the literature of science and technology that I have already referred to will obviously be an important part of this programme, as will be the basic course in mechanization and computer applications, but we are still working on the structure and details of the rest of the programme. It will be linked as naturally as possible with the core syllabus so that, for instance, this group of students would develop and supplement the basic course in cataloguing and classification with one on Indexing, Abstracting and Classification, slanted towards their particular requirements; just as the students specializing in academic or public library work would do a course on Advanced Cataloguing and Classification suited to their particular needs. Similarly, the general survey of reference works and reference service which will be compulsory for all students might be supplemented in the case of the science group by a specialized course on science literature searching. Clearly, too, they must study the organization of special libraries and information services and take account of activities such as editorial work and translation with which so many scientific libraries and information centres become involved. Some of the American schools—Drexel and Western Reserve come to mind—make use of the heading Documentation, and this might be a useful peg on which to hang, or from which to develop, some of the activities I have mentioned.

It is my hope that some really useful research will be generated from our specialization in scientific and industrial librarianship and information work. Certainly there is plenty to be done, and I cannot refrain from quoting a paragraph from a recent article in *Minerva,* by Mr Vickery.[1] He says: 'The volume of recorded information is growing exponentially, while the time available to any one man for searching for what he needs and digesting it is absolutely limited. This is the crux of the information problem.'

Mr Vickery's statement adumbrates an almost frightening range of problems and might well be the starting point for a whole programme of research.

Before leaving the subject of special library and information work I should make it clear that I do not see this sort of activity as being restricted to science and technology. Indeed, many years of my own working life have been spent in a public commercial and patents library, a banking library, and an education library, and one of our lecturers comes to us from being Librarian of the

Institute of Criminology at Cambridge. A Social Sciences special librarianship and information work course might well be a fruitful line of development when the time comes for us to expand; and I might mention that such are the times which we in universities are living in that I have already been asked to estimate for growth of the School during the Robbins era.

It might be appropriate to conclude this paper by considering what will happen to the young men and women who complete our course. The recent history of the London School shows that their diplomates divide fairly evenly between special, public and academic libraries. It is to be expected that our experience will be similar, but I believe that the whole pattern may change if public and possibly also some of the special libraries ignore some very significant developments in university library recruiting over the last year or two.

With general university expansion—and there is much more to come—there has been an increase in the size of university library staffs, and the supply of good graduates with professional qualifications is becoming progressively less adequate to meet the demand. A good graduate with his year's practical experience and a Diploma in Librarianship behind him now stands a very good chance of going straight into a University Assistant Librarianship at about £1,000 a year, on a scale rising to £1,600 or £1,700; even in some cases to £2,150 a year. In other words, he will progress through a scale that will bring him to a maximum in excess of what is now paid to many a chief librarian of a good-sized public library system.

The answer, surely, cannot be that the public libraries are not in the market for good graduates. If they are to continue to be run by men and women of the calibre of the present generation of chief and senior librarians, they have no alternative to recruiting many of their staff at graduate level, for the bright 17- and 18-year-olds who went into public librarianship in the 1920's and 1930's now go instead to university, and come on the labour market at a correspondingly later age.

If, then, the public libraries are to get a proper share of good professionally qualified graduates there must be some fundamental rethinking about their salary structure. It will just not be good enough for chief librarians to be the poor relations amongst a corporation's chief officers. Further, and even more important, the practice—or convention—by which deputies commonly receive no more than two-thirds of the chief's salary must be reconsidered, for this cripples the whole of the salary structure at the lower levels. A £2,700-a-year city librarian—and these must be fairly few and far between—with a deputy limited to about £1,800 a year implies salary prospects of no more than £1,100 or £1,200 or £1,300 for senior staff carrying out work of very considerable responsibility.

What is needed is the promotion of chief librarians to the upper division of chief officers, accompanied by an upgrading of their deputies to bring them into a relationship to their chiefs similar to that between university librarians and deputy university librarians.

I am not so clear about the salary prospects in scientific and industrial libraries, but I am quite sure that university libraries will be just as interested in our diplomates who have followed the Scientific and Industrial Librarianship course as in those who have specialized in Academic librarianship. They badly need scientists, and furthermore there are signs that they are beginning to think in terms of more service to readers, particularly in their science and applied science libraries, where teaching staff may have come in from industry and be accustomed to special library standards of service. If university libraries offer science specialists not only a good salary scale but an opportunity to use their subject and bibliographical skills, the special libraries as well as the public libraries may feel the keen wind of their competition.

I make no apology for concluding my paper on this mundane note. I see the likelihood of a great shortage of professionally qualified graduate librarians in the coming years, and we want no depressed areas in librarianship, for this would mean a state of affairs which would make a bad situation worse by nourishing one branch of the profession at the expense of another. We want good careers in university and special and public library work, careers that will attract the greatly increased number of good graduate recruits that will be essential in the years ahead. Those of us whose opportunity and privilege it is to teach the librarians of the future must accept this challenge—to enhance, by our influence and teaching, the status of our profession in every field of its activity, so that all of its members may enjoy their proper recognition and reward.

REFERENCES

1. VICKERY, B. C. Scientific information: problems and prospects. *Minerva,* vol. 2, no. 1 Autumn 1963, p. 21–38.

DISCUSSION

The most important points raised in discussion of Mr Saunders' paper are summarized here.

The wisdom of a compulsory year's practical library experience, before starting a course, was doubted by many people. In particular, this would make it difficult to get science graduates. It was also suggested that a number of teaching libraries should be developed.

An intensive recruiting campaign at both the universities and the schools was called for because the present and proposed provisions for training graduate librarians would not be sufficient to meet the demand. Mr Saunders expressed the view that some really serious research on the long-term demand for graduate librarians was necessary, to make possible realistic planning.

FURTHER MINOR BY-PRODUCTS OF RESEARCH*

Aslib Research Department

A. *Industrial library staffs in* 1955 *and* 1963

AMONG the data collected for and published in Aslib's *Survey of information/library units in industrial and commercial organizations*[1] were figures for the numbers of information/library staffs then employed, in a sample comprising fifty-two organizations, with information about their qualifications. In most cases the data related to the position in 1955–6.

In the autumn of 1963, in connection with an inquiry into the needs for professional training, the Education Officer of Aslib asked members to supply information which, *inter alia,* included data about the numbers and qualifications of their staffs. Sixteen of the organizations covered by the first Survey also provided information about staff for the later inquiry, so that comparisons of the position in 1955–6 and 1963 could be made, as shown in the tables below.

STAFFS OF SIXTEEN INDUSTRIAL INFORMATION/LIBRARY UNITS

Head of unit	Numbers having qualifications	
	1955–6	1963
Degree + FLA (or ALA)	1	1
Degree only	7	4
FLA (or ALA) only	4	9
None of the above	4	2

Supporting staff	Numbers having qualifications (some have more than one)	
	1955–6	1963
Degree	24	30
FLA (or ALA)	12	19
Sub ALA (part of registration examination)	9	22
Other relevant technical qualifications	6	17
	(31 people)	(73 people)
None of above	81	93
	112 people	166 people

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* See 'Some minor by-products of research', *Aslib Proceedings,* vol. 14, no. 2, February 1962, p. 43–5.

The total number of information/library staff (excluding heads of the units) in the sixteen organizations increased by 48 per cent during the eight-year period, and the percentage having qualifications increased from 28 per cent to 44 per cent.

HELEN AITCHISON

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B. *Serials read by research scientists*

In the course of an Aslib investigation of some aspects of the use of literature by research scientists, a report of which has been issued,[2] research scientists were asked to list journals which they read or scanned regularly. The scientists worked in a wide variety of organizations—industrial, academic, and official. From the information given, lists were prepared of the 'top ten' journals for five disciplines.

CHEMISTS The sample numbered 226. Titles listed totalled 356.

	per cent of sample reading
Journal of the Chemical Society	59
Journal of the American Chemical Society	57
Chemistry and Industry	46
Chemical Abstracts	38
Nature	36
Transactions of the Faraday Society	24
Current Chemical Papers	
Journal of Physical Chemistry	21
Proceedings of the Chemical Society	20
Chemische Berichte	17

BIOLOGISTS The sample numbered 116. Titles listed totalled 324.

Nature	58
Journal of Physiology	47
American Journal of Physiology	27
Biochemical Journal	21
Lancet	15
British Medical Journal	14
Journal of Biological Chemistry	
International Abstracts of Biological Sciences	
Physiological Reviews	
Journal of Endocrinology	13

PHYSICISTS The sample numbered 85. Titles listed totalled 191.

	per cent of sample reading
Physical Review	62
Proceedings of the Physical Society	52
Proceedings of the Royal Society. A	42
Nature	35
Physical Review Letters	34
Philosophical Magazine	28
Review of Scientific Instruments	27
Physics Letters	22
Reviews of Modern Physics	
Physics Abstracts	20

PSYCHOLOGISTS The sample numbered 65. Titles listed totalled 139.

British Journal of Psychology	65
Psychological Review	51
Quarterly Journal of Experimental Psychology	46
Psychological Bulletin	45
Journal of Experimental Psychology	38
Psychological Abstracts	37
American Journal of Psychology	35
Journal of Occupational Psychology	29
Ergonomics	25
Nature	22

MATHEMATICIANS The sample numbered 53. Titles listed totalled 141.

Mathematical Reviews	59
Proceedings of the Cambridge Philosophical Society	38
Journal of the London Mathematical Society	36
Proceedings of the Royal Society (A)	34
Proceedings of the London Mathematical Society	30
Quarterly Journal of Mechanics and Applied Mathematics	28
Journal of Fluid Mechanics	19
Journal of Mathematics and Physics	17
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JOHN MARTYN

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MEMBERS' ADVERTISEMENTS

The charge for advertisements in these columns is 4*d* per word, minimum 5*s*. An additional charge of 6*d* is made for the use of a box number.

ABILITY AND SERVICE. Technical or commercial translations into/from Dutch and German. Speller-Kuijpers, FIL, NGV, 6 Lakeside, Ealing, London W13. ALPerton 1045.

WILFRED E. GOODAY, ARSM, DIC, MIMM, FIL. Member of Translators' Guild. Rumanian and French. 161 Rivermead Court, London SW6. Renown 1912.

TRANSLATIONS FROM TURKISH. All subjects. F. P. Scott, 4 Uphill Grove, Mill Hill, London NW7.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. STAmford Hill 8564.

Appointments vacant

LIBRARY ASSISTANT is required for Technical Library situated near Tedworth, Surrey. Applicants with previous library experience preferred—should have some typing ability and a limited knowledge of French and German. Please apply Assistant Personnel Manager, Vitamins Limited, 23 Upper Mall, London W6.

NATIONAL MARITIME MUSEUM, GREENWICH: ASSISTANT KEEPERS. Two PENSIONABLE posts for men or women at least 20 on 1st March 1964, normally with 1st or 2nd class honours of post-graduate degree or equivalent. One post requires library experience and knowledge of maritime history; experience in historical research desirable. For the other post the degree should be in a scientific or mathematical subject; knowledge of navigation and interest in maritime affairs essential; knowledge of history of science desirable. Final-year students may apply. Salary (Outer London) on scale £800–£1,359 or £1,488–£2,539 according to age, qualifications, and experience. Starting salary may be above minimum on either scale. Write Civil Service Commission, 23 Savile Row, London W1, for application form, quoting 5836/64. Closing date 31st March 1964.

THE E S & A ROBINSON GROUP requires an INFORMATION OFFICER to be responsible for setting up a technical index at the Group's Central Research Laboratories in Bristol. The work involves extensive dealings with other departments and demands an energetic man of high calibre. Applicants should be male science graduates, aged up to 26, preferably Chemists with experience in information work. Experience in the paper, plastics or packaging industries would be additional qualification but is not essential. The Robinson Group is a major international manufacturer of packaging materials and the long-term prospects within the Group are excellent. Applications will be treated in strict confidence and should be made quoting reference CA and giving a concise outline of the relevant particulars to the Staff Manager, E S & A Robinson (Holdings) Ltd, Bristol 1.

LIBRARIAN, with full or partial qualifications, required for technical library. Must have had similar experience and be familiar with sources of technical information and specifications. Applications in writing giving details of qualifications, experience, age and salary required to The Personnel Manager, Belling & Lee Limited, Great Cambridge Road, Enfield, Middlesex.

ATHENS TECHNOLOGICAL INSTITUTE, Athens Center of Ekistics. Applications are invited for the post of CHIEF LIBRARIAN. Candidates should be chartered librarians, have experience in running a technical research library and orientation in applying mechanized processing techniques in library work. A reading knowledge of French and German is desirable. Salary according to qualifications and experience. Applications should be made to the Chairman of the Library Committee, Athens Technological Institute, 24 Strat. Syndesmou, Athens 136, Greece.

TECHNICAL ASSISTANT required by THE BRITISH ALUMINIUM CO. LTD in its Intelligence Department to deal with technical inquiries and editorial work on *Aluminium Abstracts*. Science graduates with knowledge of languages preferred. Applications, which will be treated in confidence, should quote ref. PR.25 and be addressed to the Staff Manager, The British Aluminium Company Limited, Norfolk House, St. James's Square, London SW1.

LIBRARIAN required for the Information Section (R. & D. D.), Pressed Steel Co. Ltd, Cowley, Oxford. The work will be mainly in cataloguing and classification (by a special scheme) and in building up the library. There will be opportunities for advancement in an expanding section. The person appointed will be responsible to the Information Officer, who is a Chartered Librarian. Candidates should be Associates of the Library Association, or at least have two parts of the Registration Examination, including Part A. A degree, experience in a technical special library, scientific, technical or relevant linguistic knowledge, and an alert inquiring mind, will all be advantageous and will affect the salary paid. Excellent conditions of employment including Contributory Pension Scheme with Free Life Insurance. Applications, giving full particulars, may be made to the Personnel Manager.

GEORGE WIMPEY & CO. LTD, CENTRAL LABORATORY, Lancaster Road, Southall, Middx, require a Chartered Librarian to take charge of a technical library and information service. Duties include cataloguing, classification (UDC), abstracting, indexing, and circulation of Technical and Information Sheets. Experience in a reference, technical or scientific library is desirable. Salary according to experience. Applications to the Manager, George Wimpey & Co. Ltd, Central Laboratory, at the above address.

NATIONAL REFERENCE LIBRARY OF SCIENCE AND INVENTION. SCIENCE GRADUATES. There are vacancies for men or women aged at least 20 (at least 30 for Senior Research Assistant posts) in the British Museum, Department of Printed Books, eight as Assistant Keepers, two as Senior Research Assistants, and ten as Research Assistants, for preparatory work for the National Reference Library of Science and Invention to be erected on the South Bank of the Thames. This library is to be formed from the existing Patent Office Library, from the scientific holdings of the British Museum, and from literature at present held by neither institution.

DUTIES. Planning is well in hand, and the next stages of preparation are mainly concerned with stock selection and with classification, including the reclassification of the Patent Office Library holdings. The work will grow in variety, and when the library opens all scientific staff will be called upon to control and exploit the resources of the library in their subject fields for the benefit of users. Till then the work will mainly be handled within the Department of Printed Books of the British Museum.

QUALIFICATIONS. The formal qualifications given below are required, together with a willingness to cope with foreign languages. The additional personal qualities needed are a preference for dealing with the literature of science rather than for working in the laboratory, and the wish to be associated with this major library project. Experience of working with scientific literature and a liking for information work would therefore be advantages.

All the ASSISTANT KEEPER posts require a 1st or 2nd class honours degree in the Natural Sciences or a degree awarded for post-graduate work in that field, or an equivalent qualification with relevant experience. For one post some knowledge of or a willingness to learn Japanese or Chinese is needed. All the SENIOR RESEARCH ASSISTANT and RESEARCH ASSISTANT posts require a degree in the Natural Sciences, or an equivalent qualification with relevant experience.

SALARIES. Salaries range from £635 to £2,544 according to age, qualifications, experience, and post recommended for. Promotion prospects. For further particulars and application form write Civil Service Commission, Savile Row, London W1 (preferably by postcard) quoting 5844/64. FOR ALL POSTS FINAL YEAR STUDENTS MAY APPLY. Closing date 10th April 1964.

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TECHNICAL LIBRARIAN

A Technical Librarian is required by Rolls-Royce Limited to take charge of the Library serving their advanced research work in the fields of material science and aerodynamics.

Applicants must be Chartered Librarians in the age group 25–35 with experience in a special library and be familiar with U.D.C.

Candidates will preferably possess a scientific background with some reading ability in French/German and possess a degree.

The library is pleasantly located on the outskirts of Derby, and conditions of work are excellent.

Applications should be addressed to the Head of the Advanced Research Group, Rolls-Royce Limited, Old Hall, Littleover, Derby.

THE INSTITUTION OF ELECTRICAL ENGINEERS

DIRECTOR

required for

'SCIENCE ABSTRACTS'

The Director will be responsible to the Secretary of the Institution for the management, publication and development of 'Science Abstracts', comprising 'Physics Abstracts' and 'Electrical Engineering Abstracts'. Applicants, preferably aged between 35 and 50, should be graduates in physics or electrical engineering and have administrative experience. Experience in publishing or scientific information work would be an advantage. Starting salary not less than £2,200 p.a. Pension scheme. Applications marked 'Personal' should be addressed to:

The Secretary,
The Institution of Electrical Engineers,
Savoy Place,
London, W.C.2.

Aslib Proceedings

incorporating Aslib Information

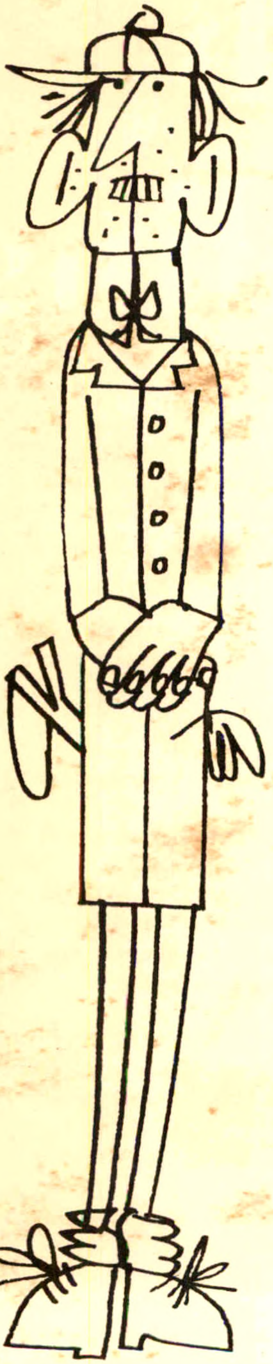
CALCUTTA UNIVERSITY CENTRAL LIBRARY

Mechanized Document Control: a Review of Some Recent Research

F. W. LANCASTER

ASLIB · 3 BELGRAVE SQUARE · LONDON SW1

Aslib Proc. vol. 16 no. 4 p. 125-158 London, April 1964



the most unattractive boy we ever met

He was a great gangling creature. And on his birthday he told his mother he'd decided something. From now on, he was too big to be polite. Maybe he was smarter than

US AT BLACKWELLS.

No question, you can get away with being very bad-mannered indeed if you're big enough. (And there's lots of organizations to prove it.) But we have an idea

AT BLACKWELLS

that a giant should be gentle. And the more gigantic it becomes, the more care it should take with its manners. It's nice to be huge,

BLACKWELLS ENJOYS EVERY BIT OF ITS HUGENESS.

It's nice to feel that your scope and strength is bigger than almost anyone else's

DITTO DITTO.

But we want to be a *likeable* giant in the book business. One that gives you all the advantages of size; yet one you can treat as comfortably as a friend.

ANYTIME YOU THINK WE'RE GETTING

TOO BIG TO BE POLITE—

DO WHAT THE BOY'S MOTHER

SHOULD HAVE DONE TO HIM

AND RAP US *hard* OVER THE KNUCKLES!

BLACKWELLS BROAD STREET OXFORD

ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 April 1964 Number 4

ASLIB CALENDAR 1964

April

WED.22. Evening meeting at Aslib, 5 for 5.30 p.m. 'Taking stock—a fresh look at education for special librarians', by Jack Bird.

THUR.23 – SAT.25. Northern Branch conference at Southport.

WED.29. Afternoon meeting at Aslib, 3 p.m. 'Teaching machines', by G. H. McLaughlin. See paragraph below.

May

MON.4 – FRI.8. Senior introductory course to special library and information work.

WED.6. Film Libraries Group visit to Kodak Museum.

THUR.7. Technical Translation Group meeting at Aslib, 4 p.m. 'A unique venture—new honours courses in modern languages for translators and interpreters', by J. C. Sager.

THUR.14. 'Information on a shoestring' course. See paragraph below.

WED.20. Evening meeting at Aslib, 5 for 5.30 p.m. 'O & M in the special library', by E. H. E. Jones. See paragraph below.

SAT.23 – SUN.24. Engineering Group conference at Leamington Spa.

TUE.26. Advanced course on patents. See paragraph below.

June

TUE.2. Evening meeting at Aslib, 5 for 5.30 p.m. 'How to be an expert overseas', by B. Agard Evans, O.B.E. See paragraph below.

FRI.5 – SUN.7. Electronics Group annual conference at Ashridge College. See paragraph below.

WED.10. Annual General Meeting at Aslib, 12 noon. See paragraph below.

Annual General Meeting, 1964

The next Annual General Meeting of Aslib will be held at 12 noon on Wednesday 10th June 1964, at 3 Belgrave Square. Papers will be circulated in due course. It is intended to arrange a buffet luncheon after the meeting, and in the afternoon the working departments of Aslib headquarters will be open to visitors. A separate notice and application form for luncheon tickets is being circulated and the Director extends a warm invitation to all members to take this opportunity of meeting the staff and discussing their work with them.

New Honorary Member: Mr Ben Fullman

Members will be very pleased to know that Honorary Membership of Aslib has been conferred by Council on Mr Benjamin Fullman, M.B.E., B.SC., F.R.I.C., F.I.M. He will be the tenth Honorary Member of Aslib. Mr Fullman was a member of Council from 1946 to 1953; he has been Chairman of the Education Committee and Aslib's representative on the Executive Committee of the National Central Library and on the Standing Scientific Library and Technical Information Committee of the Advisory Council on Scientific Policy. He recently retired from long service as Chief Information Officer of the British Non-Ferrous Metals Research Association, where his exceptional contributions to information work won him the M.B.E. in 1957. A tribute on the occasion of his retirement was published in *Aslib Proceedings* for February 1964. Members will wish to congratulate Mr Fullman on his Honorary Membership which is an honour not only to himself but to Aslib.

New Members of Staff of Aslib Research Department

Dr Herbert Coblans, M.SC., PH.D., Mr Harry East, B.SC., and Miss Patricia Sweeting, B.SOC.SC., have joined the staff of the Research Department.

Dr Coblans, a well-known figure in the scientific documentation field, has been Head of the Information Services of CERN, Geneva, for the past ten years. A physical chemist by training, he has been a university librarian in South Africa, Librarian of UNESCO, and a UNESCO consultant in South America.

Mr East comes to Aslib from Unilever Research Laboratories, where he has been developing a computerized information system. Both Dr Coblans and Mr East will be undertaking research on mechanized systems.

Miss Sweeting is a social scientist and statistician who has been working with the Central Office of Information, Social Survey.

Aslib Afternoon Meeting

Mr G. Harry McLaughlin, Lecturer in Communication at Northampton College of Technology, will be the speaker at an afternoon meeting on Wednesday 29th April, and his subject will be 'Teaching machines'. Mr McLaughlin will discuss the principles of self-instruction devices, and the ways in which programmed instruction could be used for teaching student librarians, and in information retrieval. His talk will be illustrated by a display of teaching machines and programmed textbooks, arranged by Mr Gordon H. Wright, County Technical Librarian of Hertfordshire (display on view from 2 pm).

The meeting will be held at 3 Belgrave Square, at 3 pm. There will be a break for tea at about 4 pm, followed from 4.45 to 5.30 pm by discussion. There will be no fee to attend the meeting, but application forms, available from Aslib, should be completed.

Evening Meetings

Mr E. H. Ernest Jones, formerly Head of Central Information Services, Shell International Petroleum Co. Ltd, will be the speaker on Wednesday 20th May, on 'O & M in the special library'. The chair will be taken by Mr C. W. Hanson, Head of Research at Aslib. Mr Jones will discuss the ways in which the head of a special library or information division can make use of O & M practice in applying his knowledge of administrative efficiency and work methods to his own information service.

On Tuesday 2nd June Mr B. Agard Evans, O.B.E., Chief Librarian, Ministry of Public Building and Works, will talk on 'How to be an expert overseas'. Dr H. Coblans, formerly Head of the Scientific Information Service, CERN, Geneva, will be in the chair. Mr Evans has recently been twice to India as a United Nations adviser on building documentation to the Indian Government. He will speak about the human aspects of his missions and the conditions that such advisers have to face. It is hoped that other 'experts' in this kind of task will be present and will contribute to the discussion from their own experiences.

Both meetings will take place at 3 Belgrave Square at 5.30 pm, and tea will be served at 5 o'clock. Application forms were distributed with the March issue of *Aslib Proceedings* and should be returned, for Mr Jones's talk, not later than 11th May; and for Mr Evans' not later than 19th May.

Information on a Shoestring

Many people—scientists, managers, administrators, and their secretaries—working in organizations without established information departments are frequently faced with the problem of finding information or getting hold of publications or documents of importance to their work. They are often frustrated by their lack of elementary knowledge of sources of information and of indexing techniques. A quite elementary knowledge of the availability of publications and of ways of obtaining help from others would be of great help to them.

To meet the needs of such people Aslib has devised a course entitled 'Information on a shoestring' which aims to provide them with some basic knowledge of the quickest and simplest ways of finding out what is available and of how to make the best use of the resources they have. This course has already been run with great success in the past and is again being presented, at Aslib headquarters, on Thursday 14th May. The fee for the course will be 3½ guineas to members of Aslib and 6 guineas to others. A full programme and application form are enclosed with this issue. Provisional bookings will be accepted by telephone or telex.

The New European Patent System

Under the 1956 Rome Treaty the patent systems of the member countries of the European Common Market agreed to consider combining their respective patent systems. A draft patent convention has been drawn up and parts of it are being gradually implemented. As this is of considerable importance to everyone in information work who has to deal with patents from these countries, Aslib is holding an advanced course on the subject on Thursday 26th May. The speakers will discuss the various features of the provisions for examination for novelty within the territory; the repercussions of the new system as far as quick publication is concerned; the availability of specifications in printed form; and language problems. The fee for the course will be 3½ guineas. A full programme is enclosed in this issue, and applications should be made on it. Provisional bookings will be accepted by telephone or telex.

Northern Branch

The seventeenth Annual General Meeting of the Branch was held at Manchester College of Science and Technology on 25th February. The officers and committee elected for 1964–5 are as follows. Officers: Chairman, Mr J. E. Bolton-Allen; Hon. Treasurer, Mr F. Newby; Hon. Secretary, Miss E. Boddy. Committee: Mr W. Caldwell, Miss J. Forsyth, Mr F. A. Graham, Mr L. J. Ingham, Mr A. Johnson, Mr A. B. Jordan, Mr F. L. Pearson, Mr H. A. Roche, Mr R. Sewell; and, as *ex officio* members, Mr A. C. Bubb, Mr G. H. Davison, Mr F. R. Taylor and Mr L. G. Tootell.

Electronics Group

Programmes for the sixth Annual Conference of the Group, 5th–7th June, are now available. A preliminary announcement of papers was published in the March issue of *Aslib Proceedings* and copies of the full programme have been circulated to all members of the Electronics Group. The closing date for applications is Tuesday 19th May. Other members of Aslib will be very welcome and anyone who is interested can obtain the programme and application form from Mr R. S. Lawrie, Chief Librarian, Sperry Gyroscope Company Ltd, Downshire Way, Bracknell, Berkshire.

BS 1000: English Edition of UDC

For many years a number of panels of OC/20/4, the main BSI Committee for UDC, have been working on the schedules of the Universal Decimal Classification with the aim of publishing a full and up-to-date English edition incorporating any improvements thought to be useful. The carrying out of this task has been affected by the often lengthy discussions, in the UK and abroad, required in connection with such improvements, and by the necessity for these first to be published as 'P-notes' and adopted by FID.

This has been prejudicial to the completion of the full English edition and so far certain fascicules only have been published by the BSI as parts of BS 1000. In addition to these fascicules, however, BSI has published the Abridged

Edition (BS 1000 A), the Trilingual Abridged Edition (BS 1000 B), and the Guide to the UDC (BS 1000 C).

The task of completing the full English edition by the issue of those sections at present missing from BS 1000 is recognized as urgent. Ideally the English edition should be as near perfect as possible as a classification to meet the needs of the users, but with our expanding disciplines it is clearly impossible so to modify the schedules as to meet completely, at all times, all the latest requirements.

It has accordingly been decided to aim, at this stage, at the speediest possible production of the fascicules not yet available in English, basing them for this purpose on the published German edition supplemented by the relevant 'Extensions and corrections to the UDC', thereby assuring that they correspond to the latest officially approved FID text. A crash programme is therefore being planned by BSI aiming at the publication of these schedules, if possible within a year.

The task is a formidable one, and will require a special effort from the panels concerned, assisted by the BSI Secretariat. To avoid overloading the panels it seems necessary to spread their task by increasing where appropriate their membership and by extending their number to take in those sections of the UDC for which no existing panel is currently responsible. (The present project deals only with the completion of the English edition of the currently approved full UDC text. The work of revising this text in collaboration with other interested FID members is a separate exercise which will continue but will have to take second place during the period of the crash programme.)

The panels will be provided with photocopies of the relevant sections of the German edition, and with any subsequent officially approved extensions and corrections as required. They will also have at their disposal any available documents already in English which may be of assistance.

The plan will depend for its success largely on the willing co-operation of members of existing panels, with such additional support as may be procured, and the British Standards Institution will be glad to hear from librarians, information officers and other technical experts whose interests may or may not already be known to the Institution and who are able and willing to co-operate in any given part of the present project.

La classification dècimale universelle

A manual by René Dubuc entitled *La classification décimale universelle (C.D.U.): manuel practique d'utilisation* has just been published in the series, ed by M. Paul Poindron, *Documentation et information*. M. Dubuc is the French representative on the Central Classification Committee of the FID. His text deals with the structure and principles of the UDC and assesses its use and application in various indexing systems. There are historical notes, and a bibliography and list of editions of UDC which are brought up to 1963. This book is in the same series as *La classification à facettes,* translated from Mr B. C. Vickery's *Faceted classification* which was published by Aslib.

La classification décimale universelle is published by Gauthier-Villars (Paris, 1964), price NF 20 ($4).

European Translations Centre

The fifth Newsletter of the ETC was issued in February this year, and reports on the work of the Centre since July 1962. Its translations collection has increased from 26,600 at the end of 1962 to 41,600 at the end of 1963. The number of applications for translations received during this time increased from 1,319 to 4,957.

In locating translations the Centre co-operates with the Library of the Technological University at Delft, which has a large collection of commercial translations. A union catalogue of translations from Russian scientific literature, also from Japanese and Chinese, is maintained at ETC. Details about its services may be requested from European Translations Centre, Doelenstraat 101, Delft, Netherlands.

Harvard Program on Language Data Processing

A special program on language data processing is to be held at the Harvard Summer School from 10th to 21st August. It will be conducted by the Division of Engineering and Applied Physics, and will introduce newly acquired knowledge both about natural languages and about formal languages as used in programming systems. The course fee is $400, but there will be a limited number of places for visiting scholars at half this rate.

Details may be obtained from: Language Data Processing Program, Harvard Summer School, 626 L Holyoke Center, Cambridge, Massachusetts, USA.

Information Courses

Further two-day information courses have been announced by Messrs J. L. Jolley and Partners Limited. They will be held on 8th and 9th July, 23rd and 24th September, and 18th and 19th November. All courses will be at the Bell Inn, Aston Clinton, and the fee for each will be 20 guineas. Details may be obtained from Messrs J. L. Jolley and Partners Limited, 46–48 Frogmoor, High Wycombe, Buckinghamshire.

Scottish Library Association Summer School

The summer school of the Scottish Library Association will be held from Saturday 4th July to Friday 10th July and will again be at Newbattle Abbey, near Dalkeith. The programme includes lectures on the *British National Bibliography* by Mr A. J. Wells, General Editor of the *BNB*; on American libraries, by Mr H. A. Whatley, Senior Lecturer at the Scottish School of Librarianship; on 'Cataloguing and bibliographical control' by Mr P. J. Quigg, Bibliographer, Belfast Public Libraries; and on 'Documentary reproduction' by Mr L. L. Ardern, Librarian, Scottish College of Commerce. One of the visits arranged is to the Library of the Royal Botanic Garden, Edinburgh.

The total fee will be £7 10*s* and the closing date for applications is 20th June. Programmes should be requested from Mr J. W. Cockburn, FLA, Central Public Library, George IV Bridge, Edinburgh 1.

Royal Society of Arts Journal Index

The latest in the series of ten-yearly cumulative indexes to the *Journal of the Royal Society of Arts* has recently been published. This is the 'Index to volumes CI–CX, November 1952 to November 1962' (76 pages, price 10*s*). Requests for copies should be made to the Royal Society of Arts, John Adam Street, Adelphi, London WC2.

US Government Publications

A list of United States Government publications printed outside the Government Printing Office is being compiled under the terms of a grant to the American Library Association, from the Council on Library Resources. The list will include all 1963 publications in this category received through the Documents Exploiting Project, and by the Library of Congress. The work will be directed by Mr Jennings Wood of the Library of Congress Exchange and Gift Division. Further information may be requested from the American Library Association, 50 East Huron Street, Chicago, Illinois.

MECHANIZED DOCUMENT CONTROL

A Review of Some Recent Research*

F. W. LANCASTER

Herner and Company, Washington, D.C.

SINCE the second world war, considerable research funds and effort have been spent on developing means for controlling the ever-increasing flood of recorded knowledge. As far as librarians and information officers are concerned, the problem can be divided up into five distinct stages, as shown in Figure 1.

In the United States particularly, it has long been recognized that mechanical equipment offers hope for easing the information problem. Most of the early research was devoted to stages 4 and 5 of the total problem (i.e. storage of document compressions in a form suitable for machine searching). More recently, however, an increasing number of research workers have been devoting their attention to the much more difficult task of mechanizing stages 1, 2 and 3.

There are several reasons for the shift of emphasis to automation at the input stage of information handling systems. First and foremost, it has been estimated that abstracting and indexing of input documents represent at least 80 per cent of the effort of current literature searching systems; only 20 per cent is devoted to retrieval. Indexing is an expensive and time-consuming intellectual task; machine indexing would free professional staff to devote more of their time to personal assistance to users of the document collection. Automatic document analysis would reduce subjectivity in indexing and abstracting. It would also eliminate human error. This last point is of considerable importance; in investigations carried out by the Aslib Cranfield Project, 60 per cent of the failures to recall sought documents were due to human carelessness and weakness at the input stage. Finally, machine indexing and abstracting are essential prerequisites for the development of a completely automatic information handling system—no longer a complete fantasy.

It must be stressed, however, that automatic document analysis is in the purely experimental stage. Even if automatic methods can be perfected, there still remains the problem of making these operations economic. The only means at present available for presenting a document to a computer in 'readable' format is to keypunch the text, in digitalized form, on to punched cards or paper tape and thence to magnetic tape. This is an expensive operation. Automatic document analysis looks forward to the fast-approaching day when all documents will be produced simultaneously in both printed and machine-readable form, or to the day when a universal print reading device will be developed.[1, 2]

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* Mr Lancaster was until recently employed in research work at Aslib, on the Aslib Cranfield Project. This paper was to have been given at one or more Aslib meetings in the spring of 1964, but Mr Lancaster had left to take up his new appointment in the United States before it was possible for him to present it.

FIGURE I

Stages in the control of documentary information

Stage 1

ANALYSIS
of input documents to isolate the unit concepts dealt with in each.

Stage 2

REPRESENTATION
of these unit concepts by the terms of some index language, which may be words (such as uniterms or descriptors), or a notation or other coding method.

Stage 3

LINKING
related index terms by means of a syndetic framework, usually in the form of a hierarchical classification, or network of cross-references in a thesaurus, thus facilitating retrieval of groups of related documents.

Stage 4

STORAGE
of the labelled documents or of some compression of them (i.e. document identification together with index terms and/or abstract) in a form suitable for rapid searching.

Stage 5

SEARCHING
the file of document profiles in order to locate documents whose index tags match or partially match the index tags demanded in a subject request.

AUTOMATIC PERMUTATION INDEXING

The simplest form of machine-produced index is the well-known Keyword-in-context (KWIC) index, as exemplified by *Chemical Titles* and the *Keywords Index to US Government Technical Reports*. Although most KWIC indexes have been based on titles, there is no reason why they should be so restricted. A computer, having located a key indexing term (by matching a document text against a standard file of acceptable terms, or by some statistical or other method) could automatically produce an alphabetical index of all these selected terms in the textual contexts in which they have appeared. In fact, this type of KWIC programme is being used as part of the legal retrieval system operated at the University of Pittsburgh.

The rapid growth in popularity of permutation indexing has stimulated a series of studies on the efficacy of titles as content indicators and as retrieval handles.[3, 4, 5, 6, 7, 8] In the first Cranfield Project,[9] it was discovered that KWIC indexing would have retrieved 97 per cent of the test documents known to have been relevant to the test questions. In other words, in ninety-seven out of every hundred cases, the title of a known relevant document contained at least one term demanded in the search question.

Swanson and Montgomery[3] discovered that about 86 per cent of the headings assigned by the human indexers of *Index Medicus* could in fact have been assigned by a computer on the basis of document titles alone, provided that the computer was given the *Index Medicus* subject heading list and a synonym list, or thesaurus group, of each subject heading. The authors concluded that, since keypunching and processing of titles alone is inexpensive, the whole operation would be economical, as well as being more exhaustive and consistent than human indexing. As an adjunct to his work on text searching, Swanson investigated how far the titles of documents judged relevant to a request would in themselves be good indicators of document relevance. Relevance estimates on the basis of titles for source documents were 90 per cent successful; for other relevant documents only one-third were judged relevant by title, yielding an average of about 50 per cent. It was also decided that 80 per cent of the successful retrievals in the search programme could have been performed by a machine through a process of matching words in the retrieval requests with words in the titles, taking proper account of synonyms.

Maizell[6] found that, in a sample of twenty-five articles included in both *Physics Abstracts* and *Chemical Abstracts*, the titles alone contained about 50–70 per cent of the key terms under which the articles were actually indexed. With slight revision of the titles, indexing of the same thoroughness could have been done directly from titles either by a human indexer or by machine.

Resnick,[8] in investigating the efficiency of a scheme for the selective dissemination of information, proved that there was little significant difference between titles and abstracts as relevance indicators.

APPLYING MACHINES TO THE COMPRESSION OF DOCUMENTS

A compressed representation of the subject content of a document usually takes the form of either an abstract or an index term profile. Two distinct approaches are evident in current research into the application of machines to the generation of document compressions. The proponents of one school are concerned with a study of human processes involved in indexing, and attempt to simulate these processes mechanically. Using logical and/or linguistic analysis, these investigators seek to achieve mechanically a structured representation of textual content. Advocates of the second approach to automatic document analysis, on the other hand, maintain that an index compression of a document collection does not require syntax (i.e. structure). These workers are not interested in simulating human processes, but only in the attainment of a satisfactory end product. Their methods are mainly statistical, based on occurrences and co-occurrences of keywords or descriptors.

Unstructured systems

The basic premise of unstructured methods for automatic content analysis is that the individual words in a document function as clues which provide a basis for prediction of the subject category to which the document most probably belongs, and that statistics on order, kind, frequency and location of these words are adequate to make reasonably good predictions about the subject matter of documents containing these words. Relations between words can be largely disregarded. For example, if the words 'stall', 'lift', 'delta' and 'flutter' occur frequently in a document there is a high probability that it belongs to the general category *aerodynamics*. Moreover, if two documents display closely similar vocabularies of high frequency terms, there is a strong possibility that they deal with the same subject.

In unstructured systems, criteria used for selection may be: (1) *statistical,* based on either absolute frequency of a word's occurrence in a text, or its relative frequency in relation to some reference frequency; (2) *linguistic,* either semantic or syntactic; or (3) *textual* criteria, which are either positional or editorial.

STATISTICAL CRITERIA

Absolute frequency approach

Several methods have been proposed for programming data-processing equipment to select terms from the text of a document to act as index tags for that document. There are certain similarities, however, in all of these methods. In every document, approximately 50 per cent of the text will be devoted to words which are virtually useless as retrieval handles. These include words of a connective or reiterative type, such as pronouns, articles, conjunctions, conjunctive adverbs, copula and auxiliary verbs, and quantitative adjectives. There are approximately 150 of these words, and a list can be stored in the computer memory with the instruction to ignore or delete them wherever they appear in the corpus. When dealing with collections in specialized subject fields, certain other words may be listed for deletion. These will be words which occur so commonly in the literature of the subject that they are unlikely to be of use for retrieval purposes. Such a word might be 'polymer' in a plastics library or 'hydrocarbon' in a petroleum collection. It is also customary to confound or conflate various words from the same root. For example 'heat', 'heating', 'heater', and 'heated' would all be treated as if they were the basic word 'heat'.

Having eliminated non-significant words, and made provision for conflating of word forms, the computer can be programmed to sort the residual text words in alphabetical order and to make a count of the frequency of occurrence of each. There is a computer programme, FEAT (frequency of every allowable term), available to do this. The frequency of occurrence of word pairs or multiterms* (i.e. the number of times that two or more words occur in immediate physical juxtaposition in the text) can also be counted. The result of these counts will be a frequency-ordered list of *uniterms* and *multiterms*. The most frequently occurring of these terms are selected and stored as index tags for the document. The cut-off point for the selection of index tags may be achieved either by specifying that a certain fixed number be selected for each document or by specifying that the index tags should equal a certain percentage of the total text of a document (say 1–3 per cent). As a result of this analysis a series of index tags for subsequent searching are stored in connection with every document description or document number in the file. The resulting document profile may be somewhat as follows:

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* Word pair phrases appear to be optimum. They are less ambiguous than single words yet still have significant occurrence probability, unlike phrases involving three or more words which Swanson[10] found to be almost always unsuccessful as components of search questions.

BOUNDARY LAYER TRANSITION
TRANSITION DELAY
TRANSITION ONSET
COOLING
TRANSPIRATION COOLING
MASS TRANSFER COOLING

Techniques proposed for automatic abstracting closely parallel those for automatic indexing.[11, 12] Having taken care of common words and various forms of the same word, the remaining vocabulary of a document is frequency-ordered. A cut-off point is then established, and all words occurring with a frequency above this point are regarded as significant words. The computer then looks for the intersection of these words in individual sentences. Two key words are considered to be related in a sentence if there are no more than four intervening words. A significance factor for sentences is established by searching for *clusters* (i.e. occurrences of significant words no more than four words apart), counting the number of significant words in the cluster, and dividing the square of this number by the total number or words within the cluster. Consider the sentence A B C $\overset{*}{\mathrm{D}}$ E $\overset{*}{\mathrm{F}}$ $\overset{*}{\mathrm{G}}$ H I $\overset{*}{\mathrm{J}}$ K L M N O P Q R where * represents significant words. D–J is a cluster containing four significant words. $4 \times 4 = 16$, divided by total number of clustered words, 7, equals 2.3. 2.3 is therefore the significance factor for the sentence A–R.

If several clusters are formed in the same sentence, the significance factor can be taken either from the highest cluster or from the sum of the clusters. The sentences with the highest significance factors are chosen and printed out, in order of their occurrence in the text, to form the auto-extract. A cut-off point can be established on the basis of either a fixed number of sentences or enough sentences to equal a certain percentage of total document text. When dealing with very long documents, it may be preferable to have the computer select and print out significant sentences for each section of the publication. Since abstracts should emphasize the particular significance of an article for the organization for whom the abstract is being prepared, an additional weighting could be given to a certain category or list of words to ensure that sentences containing one or more occurrences of these words would be selected for the abstract. A useful adjunct to an auto-extract would be a printout of all names, whether of persons, organizations, products, materials, and so on, occurring in the document.

Relative frequency approach

Other investigators[13, 14] have pointed out that word frequency alone is not an adequate criterion for selection of index tags. For one thing, certain non-function words which usually have high frequency without high importance may indeed be highly significant in certain contexts. A good example is the word 'connection' which would be non-significant in most contexts except that of mechanical engineering. Contrariwise, a highly specialized term, rare in general usage, might be very significant in a document in which it did not rank high in the frequency count. Word *potency* is therefore very important. The key words of a document are those which occur more frequently than the expected frequency. This relative frequency approach to indexing gives low significance to normally rare words which occur rarely in a document, and also to common words used frequently. It gives high significance to normally rare words used frequently in a document. The technique implies the generation, for every subject field in a library collection, of frequency-ordered vocabularies or *idioglossaries* (i.e. lists of words occurring commonly in these subject fields with average frequencies of occurrence). Incoming documents are scanned and their vocabularies are compared with a common general frequency-ordered vocabulary.* On this basis, significant words (i.e. normally rare words used frequently) for the document are determined. The computer matches these significant words with its stored idioglossaries to find the 'best fit'. This would result in the document being assigned to a general category, such as physics. The significant words are again compared with the frequency-ordered physics vocabulary, and those words which occur above their expected frequency (as determined by the stored physics vocabulary) are chosen as index tags. Additional significance or weighting could be assigned to words occurring in key portions of the document, such as title, abstract and conclusions.

Damereau[16] has discussed functions for selection of terms by relative frequency. Obvious ones are f/r *or* $f-r$ *or* $f/f + r$ where $f =$ a word's relative frequency within a document, and $r =$ its relative frequency in general use. A fourth function relates occurrence frequencies to the Poisson distribution function.

NON-STATISTICAL CRITERIA

Various non-statistical criteria for selection of index tags from documents have been suggested. These are usually intended to supplement rather than replace the statistical criteria. In some cases they obviate the necessity for statistical counts on complete texts.

Linguistic criteria

a. Semantic. A computer could be programmed to look for certain clue words, or clue phrases, the occurrence of which would normally signal a concise statement on the topic of the article. Such clues might include 'conclusion', 'summary', 'it was proved' and like statements.

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* A favourite source is the Thorndike–Lorge[15] count; this is, however, somewhat outdated and slanted towards literary rather than scientific English.

b. Syntactic. Clues as to key information-bearing sentences may be derived from an analysis of structural patterns within documents. For example, experiments with pseudo-auto-extracts have shown that human extractors tend to select sentences characterized by a limited number of phrase-structure patterns.

Baxendale[17] has proposed that only prepositional phrases should be looked for, on the grounds that a prepositional phrase is a unit of expression with a more flexible function than any other syntactical unit and is likely to reflect the contents of an article more closely than any other simple construction. Moreover, the nouns and adjectival modifiers in prepositional phrases are often significant multiterms for retrieval purposes. In this method, the first four words following each preposition are selected as potential index tags, unless a second preposition or a punctuation mark intervenes, in which case a shorter phrase is selected. The most frequently occurring uniterms and multiterms thus selected are finally chosen as index tags. A computer can be programmed to search for prepositions; there are only about fifty of these, and they rarely act as any other part of speech.

Another suggestion[18] is that the parts of a document likely to be of most value for determination of content are those for which the number of initial occurrences of nouns is greater than average for the document as a whole. This approach could be extended from first occurrences of nouns to first occurrences of word stems.

Textual criteria

a. Positional. A further proposal from Baxendale is that only the words in the first and last sentences of every paragraph need be counted, since an investigation of a particular collection indicated that the first sentence of a paragraph was the *topic sentence* (i.e. most significant information-bearing sentence) in 85 per cent of cases, and the last sentence was the topic sentence 7 per cent of the time.

Alternatively, sentences preceded by the words 'introduction', 'summary', or 'conclusions' should be of more than average representativeness. Section headings usually have high information content; so do captions of pictures and diagrams.

b. Editorial. Such features as capitalization, italicization and punctuation may be usable as content indicators, although they are probably undependable because of variation from journal to journal. Capitalization is, of course, a useful way of selecting proper nouns—a list of which, Luhn suggested, would be a valuable adjunct to an auto-extract.

MACHINE ASSIGNMENT OF TAGS TO DOCUMENTS

The techniques outlined so far have been concerned with *extracting* index tags from the terms actually used in a document. Work has also been performed on the machine *assignment* of tags. This is a more difficult process. It implies the pre-existence of a classification or list of subject headings for the topics of the collection. In this case, machine indexing involves scanning the text of a document and, on the basis of its vocabulary, assigning the item to a particular category in the classification.

Investigations conducted in this area (e.g. reference 19) have involved the examination of an experimental corpus of documents (a 'teaching sample'), and the assignment of each item, by human indexers, to the most appropriate category in the classification. The next step is to carry out a count of word frequencies in the documents comprising each subset (i.e. belonging to each category). The problem is to analyse the resulting frequency-ordered vocabularies to isolate words which would be good *clue words* or *predictors* of each category. The syntactical words can be discarded immediately; so can the words too common in the subject field (i.e. words which tend to occur frequently in the whole corpus and which would therefore be poor predictors of individual categories). Words occurring only rarely in the document collection are also abandoned since these, while potent for the retrieval of single documents, are inefficient clue words for the required task of finding groups of related documents, because of their rareness. Among the remaining terms (those which occur neither very frequently nor very infrequently throughout the corpus), it should be possible to select a few which occur frequently in one particular subset but infrequently in others. These will be chosen as clue words for prediction of the category. Having chosen a few clue words for each category, a second corpus of documents in the same subject field is analysed by human analysts and each one is assigned to its appropriate category. This second, validation, corpus is then keypunched and fed to the computer, which makes predictions (i.e. assigns each item to one or more categories) on the basis of the frequency of occurrence of clue words. So far, in investigations of this nature, documents have usually been assigned to categories with about 50 per cent success (as measured by the human assignment). While this does not sound very encouraging, it should be remembered that there is zero probability of doing as well or better purely by chance.

Harold Borko, of the System Development Corporation, has carried this operation a little further.[20, 21] A significant group of clue words is chosen from the vocabulary of an experimental collection. These are arranged in a document/term matrix to show the frequency of occurrence of each term in each document (see Figure 2). A correlation coefficient for each word pair is then computed,* based on their co-occurrence in the document set. The resulting term/term matrix (see Figure 3) is then factor analysed and a series of factors are isolated. These factors, when interpreted and named on the basis of the terms with high loadings which appear in each of the factors, become the classes of an empirical classification. The terms with high loadings in each factor are the clue words or predictors of the categories. In Borko's investigation the documents in the second corpus were assigned to categories on the basis of a numerical value computed from the factor loading of a term in a category multiplied by the number of occurrences of the term. Approximately 50 per cent success in classification was achieved.

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* The correlation coefficient is a decimal number varying from +1.000 to −1.000. +1.000 would mean a perfect correlation (i.e. every time A occurs so also does B). A zero correlation would indicate no relationship between the occurrence of the two words in documents, and a negative correlation would mean if word A occurs then B is not likely to occur in the same document.

DOCUMENTS

TERMS	A	B	C	D	E	F	G	H	I
Heat	25	9	17	20	30	2	1	17	0
Liquid	9	6	0	2	4	0	3	21	9
Boiling	0	12	12	4	3	0	12	9	12
Nucleate	0	0	0	2	0	0	5	0	0
Steam	7	12	24	9	7	1	2	4	0
Boiler	7	8	4	10	12	16	8	25	2
Corrosion	12	4	0	0	10	12	20	0	0
Tube	8	3	4	2	12	7	16	6	0
Metal	15	12	7	0	9	20	8	0	5
Conduction	8	0	0	12	0	0	0	0	0

FIGURE 2

Part of a document/term matrix

	Flutter	Lift	Drag	Delta	Wing	Aileron	Buzz	Flow	Inviscid
Flutter		0.6105	0.2756	0.0974	0.6902	0.3620	0.5525	0.9806	0.1762
Lift	0.6105		0.3891	0.1715	0.6824	0.1105	−0.1963	0.9548	−0.2187
Drag	0.2756	0.3891		0.0512	0.7123	−0.2271	−0.2754	0.7056	0.0034
Delta	0.0974	0.1715	0.0512		0.9802	0.3610	0.0652	0.7049	0.0021
Wing	0.6902	0.6824	0.7123	0.9802		0.4175	0.0962	0.8624	0.0921
Aileron	0.3620	0.1105	−0.2271	0.3610	0.4175		0.2408	0.5610	−0.3821
Buzz	0.5525	−0.1963	−0.2754	0.0652	0.0962	0.2408		0.4830	−0.6214
Flow	0.9806	0.9548	0.7056	0.7049	0.8624	0.5610	0.4830		0.1211
Inviscid	0.1762	−0.2187	0.0034	0.0021	0.0921	−0.3821	−0.6214	0.1211	

FIGURE 3

Part of a term/term matrix

At the NATO Advanced Study Institute on Automatic Document Analysis, held in Venice in July 1963, Mary Stevens described experiments conducted at the National Bureau of Standards in machine assignment of descriptors. The investigation, called SADSACT (Self assigned descriptors from self and cited titles), analysed a teaching sample to derive an association factor between acceptable descriptors and words likely to occur in document titles. Actual input to the machine consisted of titles of the incoming documents and titles of the papers cited by these documents. On the basis of the previously derived vocabulary/descriptor matrix, the computer automatically assigns descriptors and establishes a cut-off point. Once more the success rate for assignment was 50 per cent (as measured by human assignment).

In this area of machine assignment must be mentioned the work of Susan Artandi, who has investigated the feasibility of machine compilation of book indexes.[22] Working with chemistry texts, she derived a list of index entries ('expression terms') and a list of associated phrases ('detection terms'), the occurrence of any one of which in a page of text would cause one of the index entries to be selected for that page. She claims that the computer-produced index was comparable in quality to a conventional index, although much more expensive. However, a large part of the expense was that of putting the text into machinable form.

Structured systems

A structured system is one with syntax. Several investigators have studied methods of producing structured compressions of documents (i.e. compressions which retain the precise relationships between concepts displayed in the original text). This implies taking into account not only the presence of certain words in a text, but also the principal analytic (generic or inclusion) and synthetic (dependence and equivalence) relations between these words. These workers, who have been influenced chiefly by Carnap,[23] Chomsky,[24] and Harris,[25] are applying to automatic indexing and abstracting the work done (and computer programmes available) on the automatic analysis of English sentence structure. The clues supplied by sentence structure are used to indicate the relative importance and organization of the information within the sentence. Thus, a structured representation of information content can be achieved without exhaustive semantic analysis.

An automatic syntactic analysis (sentence parsing) programme is applied to the text to determine structural dependencies between words in the sentence, the final object being to reduce the complete text to a set of minimal sentences by means of certain *transformations*. In other words, documents are condensed to basic skeletal sentences (core or kernel sentences), with normalized terms, through elimination of modifiers, dependent clauses, prepositional phrases, and other subordinate elements. The reduced syntactic structure thus created may be stored on tape in tree, or abstract graph, form, each word being a node in the tree, and the syntactic dependencies represented by branches.[26] Computer programmes are available for converting the output of an automatic syntactic analysis into a tree.

A simplified automatic semantic analysis can be applied to the reduced syntactic trees with the object of determining the role of a given semantic unit within a sentence, and to resolve problems such as homonymy which are essentially semantic. Relational markers are then introduced into the tree structure to replace functional words (i.e. they act as role indicators).

Reichenbach[27] suggested in 1947 that traditional grammatical analysis ignored many of the logical relations inhering in the structure of sentences; he proposed a new grammar based on the calculus of functions. Following Reichenbach, the Itek Corporation[28] has developed logico-linguistic rules for normalizing natural language expressions. The basic elements of the grammar are a *function* (predicate) and its *arguments* (complements), the former corresponding to *properties* of things and *relations* among things, and the latter corresponding to the *things* themselves. Syntactic relations are made explicit in terms of *graphic connectivity*: each node represents some predicate or an argument of a predicate, and the branches or *links* connect a predicate with its arguments. A much simplified example, derived from the sentence 'Smoke visualization of interaction between boundary layer and shock wave', is shown in Figure 4. The roles which arguments play in relation to a function (as exemplified by the connectives 'between', 'of', etc. in Figure 4) are expressed by a limited number of basic role indicators.

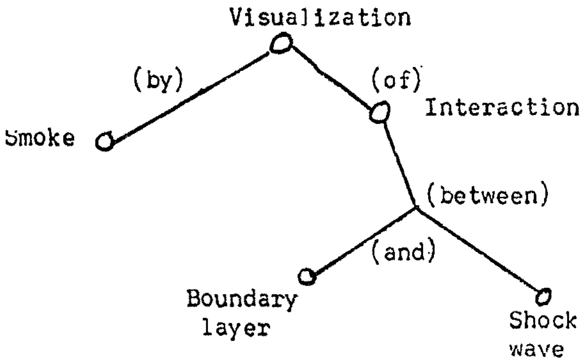

FIGURE 4

In searching a structured file in graph form, incoming questions are converted to trees and compared with the store to find one of the following: (1) *graphic isomorphism* (i.e. a perfect match); (2) *subgraphs,* (3) *partial graphs,* or (4) *partial subgraphs.* Text segments having the greatest commonality of vocabulary and dependency relations with the vocabulary and dependency relations of the question are assumed to be the best candidates for answers.

One of the most developed of the structured systems, Gardin's SYNTOL (Syntagmatic organization language),[29] removes the irregularities of natural language by transformation into a documentary metalanguage. The transformation follows well-defined logico-linguistic rules suitable for incorporation into an algorithm for automatic processing. SYNTOL allows the creation of document compressions of varying degrees of syntactic reduction. *Recall* or *relevance* ratios for individual searches can be varied by means of *modulations* which alter the lexical or syntactical features of the question.

COMPARISON OF STRUCTURED AND UNSTRUCTURED SYSTEMS

The developers of statistical methods of indexing maintain that structure is unnecessary; it can be replaced by proximity relationships between terms. Besides the obvious advantage of ease of application, there would seem to be several reasons why statistical methods are to be preferred to syntactic at present. For one thing, statistical methods are less affected by literary style. For another, automatic syntactic analysis is still in its infancy. Finally, statistical methods tend to produce groups of related documents, whereas syntactic analysis tends towards unique definition of documents. If two structured compressions show a high degree of similarity, it is likely that both were derived from the same document. It is probably true to say that, for the retrieval of individual sentences, the preciseness of syntactic analysis may be required, whereas for the retrieval of groups of related documents, simple index terms similarity will usually suffice.

COMPLETE TEXTUAL SEARCHING

The experiments so far described have all involved some form of compression of a document collection—usually a compression of the text of a document into a number of index tags representing its content. However, in even the best compression there is a loss of information. For this reason, other investigators have been considering the possibilities of making the complete text of a document collection available for searching. The text is keypunched and transferred to magnetic tape. Common words are deleted and word forms are conflated. The residual vocabulary is then ordered alphabetically and a concordance tape is produced showing for each word the exact location (document, sentence and word number) of its every occurrence in the complete corpus. The most ambitious programme in this field of investigation has been undertaken at the University of Pittsburgh[30, 31, 32] where the complete statutes of Pennsylvania and certain other states are available for machine scanning. However, not all work on complete textual scanning has been done as an end in itself; some investigators (e.g. reference 33) have used it rather as an aid in formulating rules for machine selection of index tags.

Both Swanson[34] and Luhn have envisaged the creation of a comprehensive thesaurus for a subject field, so that a computer can scan a text and assign all words encountered a numerical code representing a conceptual or notional group. Such a thesaurus group may consist of words representing nearly synonymous concepts and/or concepts hierarchically related. It may also conflate words from the same root. For example, a notional group labelled BODY OF REVOLUTION might include this term along with such others as OGIVE, OGIVAL, CYLINDER, SPHERE, etc. Whenever a document contains one of these words, it will be assigned the number representing the thesaurus group.

In the index, every document identification will be associated with a series of numbers standing for thesaurus groups. Against each group number may be a figure indicating how many times the notion has occurred in the document. This file, which is essentially a compressed form of the complete document texts, may be searched by demanding intersections of two or more thesaurus groups. Further search refinements may be introduced: minimum occurrences of certain thesaurus groups in a document may be required, or it can be specified that two thesaurus groups should occur within a certain distance of each other in a text.* This last device, which is roughly equivalent to *interfixing* or the use of *links,* is the statistical documentalist's sole substitute for syntax.

Instead of making the inquirer phrase his question in terms of notional groups, it is possible to present the original natural language questions, in digitalized form, directly to the computer. The computer would then check each word and word pair of the question against its stored thesaurus, discard functional words (which will not appear in the thesaurus), and assign the remaining uniterms and multiterms to their respective thesaurus groups. Swanson has suggested that notional groups should be assigned weights according to degree of potency as retrieval handles. The score of any given article could then be calculated by summing the weights of those notions in the article which coincide with the notions in the search prescription. The computer output would then be a list of articles in order of decreasing *relevance score.*

In complete textual searching, a blank sort may result from a demand for the intersection of two notions. It is possible, under these circumstances, to select one of the notions and ask the computer to print out all sentences containing notions that have been associated with it (i.e. have co-occurred in the same sentence). Thus, a searcher may be able to discover an associative trail between a starting term and other possibly related terms. A similar programming aid, used at the University of Pittsburgh, is a supplementary KWIC programme, applied to the concordance tape. This makes it possible to produce a rapid listing of any significant phrase, say *good faith,* together with its immediate context in the statutes.

Question-answering systems

Where the complete text of a body of information is stored in machine searchable form, it is possible to retrieve individual sentences in answer to individual questions. This may be regarded as data retrieval rather than document retrieval. Furthermore, where no single sentence in the corpus appears likely to answer the problem posed, it is possible to instruct the data-processing equipment to retrieve the smallest subset of sentences which might be relevant.[35] Such a subset may be regarded as a chain in which each sentence is related to a successor sentence by one or more common word links. As an example, if the question posed to the collection is 'Are there any lions in Europe?', the chaining technique may retrieve the following subset of sentences: (1) There are lions in zoos, (2) There is a zoo in London, (3) London is the capital of England, (4) England is part of Europe.

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* In one of Swanson's tests, 60 per cent of the irrelevant material could have been eliminated, with a loss of only 13 per cent in relevant documents, by specifying that the various search terms should all occur within a span of four sentences.

TOWARDS AUTOMATIC CLASS-FORMING PROCESSES

In any collection, not all documents which may be relevant to a particular request are identified by the exact terms specified by the requestor. Some may be characterized by nearly synonymous terms, others by terms related hierarchically (specifically or generically) to the starting terms. In humanly derived systems, a syndetic structure is formed to link together related concepts, or, rather, the terms representing them. This syndetic structure usually takes the form of either a classification schedule or a network of cross-references in a list of subject headings or thesaurus. It is obvious, then, that if fully automatic documentation systems are ever to materialize, some means must be found for replacing these humanly devised groupings with machine-produced syndetics. Considerable work on this problem is already being carried out by means of statistical methods.

The basic tool used in automatic class-forming operations is the previously mentioned document/term matrix (Figure 2). By means of such a matrix, it is possible to perform either of two operations: (1) the automatic grouping of documents on the basis of the terms they contain, or (2) the automatic grouping of terms on the basis of the documents which contain them.[36] Borko (see above) performed the second of these tasks; he derived correlation coefficients for word pairs, based on the co-occurrences of the two words in the document collection. He then created an empirical classification by factor analysis of the resulting term/term matrix.

Similar work has been conducted in England by Needham at the Cambridge Language Research Unit.[37, 38] The early efforts at CLRU were concerned with developing an improved method of grouping terms into multiple hierarchies containing *meets* as well as *joins* (i.e. a Boolean lattice; Dewey-style hierarchies contain only joins). More recently, however, research on the automatic derivation of the lattice has been carried out. By vector analysis of the usual term similarity matrix (reflecting a co-occurrence coefficient for terms based on the ratio $\left.\frac{\text{Number of documents in which terms co-occur}}{\text{Number of documents in which at least one occurs}}\right\}$, *clumps* (i.e. classes or clusters) of related terms are derived. Put simply, a group of terms forms a legitimate clump if the sum of the connections of any member to the other members exceeds the sum of its connections to non-members, and vice-versa for non-members.

In CLRU experiments documents are indexed not only by single index terms but, automatically, by the clumps to which the index terms belong. Similarly, a subject request, couched in the form of index terms, is automatically expanded into a clump list. Documents can then be retrieved on the basis of simple index term and/or clump similarity. It must be assumed that, compared with searching on the basis of co-ordinations of single terms, this clustering process will tend towards improving recall of relevant documents, while at the same time reducing the relevance ratio of a search.

This principle of grouping or linking index terms by means of statistical associations is the basis of so-called *associative retrieval systems,* on which extremely interesting work has been carried out, notably by Stiles,[39] Giuliano,[40, 41] and

Spiegel.[42] Basically, these systems accept input in the form of index terms, which may be mechanically or humanly derived. An elaborate network of cross-references is then developed for this corpus of terms, based on associations reflecting co-occurrence statistics. The justification for this approach is the simple recognition that if term B always appears in an index term profile when term A appears, it obviously does not matter which one is used in a search prescription. This would indicate a perfect correlation between the two terms (i.e. complete interchangeability) and in the syndetic framework these terms would be coupled with the highest strength. Throughout the syndetic framework, terms are coupled with varying degrees of strength based on co-occurrence statistics.

Stiles' association factor is not based purely on number of co-occurrences but rather on the discrepancy between the observed joint occurrence and the expected joint occurrence, assuming independence. Doyle[43] proposed the simple equation $\frac{f}{A + B - f}$ where f = *prevalence* of co-occurrence of terms A and B in documents, A = *prevalence* of occurrence of term A, and B = *prevalence* of occurrence of term B.

Two terms which are highly associated in an associative network may have a semantic closeness. On the other hand, there may be no apparent semantic relationship at all: the two terms are related only in that they have occurred together with significant frequency (i.e. they have a 'contiguity relationship').

Such a machine-derived association network may be stored in a computer memory. It thus becomes possible for the machine automatically to elaborate on the original search terms in order to retrieve probably relevant documents which may not have been labelled by the original terms, but by other terms statistically related to them. Given a request consisting of, say, three search terms, the computer will consult its associative network to expand this group into a larger group of terms which are statistically related *to all three starting terms*. This expanded list of starting terms and *first generation terms* may itself be elaborated on to yield a set of *second generation terms*. The sum of the association factors for each term, divided by the total number of terms in the final expanded list, gives a weight which allows arrangement of the terms according to probable relevance to a request. In searching the collection, documents are retrieved which have a sufficient number of these terms so that the sum of their weights is above a given value.

For example, given a request for papers on 'stability of laminar boundary layers' the search elaboration shown opposite may result. When the association factors for all twelve terms are summed, it may be that the terms TRANSITION and TURBULENCE prove to have the highest weights for the original search request. It is obvious then, that an associative retrieval system is capable of retrieving probably relevant documents even though they may not have been labelled by any of the starting terms.

Such a retrieval system can generate an output of documents in order of probable relevance. Of course, it is possible to achieve this form of output in a non-mechanized system. The simplest method[44] of achieving such an ordering

STARTING TERMS	FIRST GENERATION TERMS (terms related, on the basis of co-occurrence, to all four starting terms)	SECOND GENERATION TERMS (i.e. top-ranking terms from a list of other terms statistically related to starting terms, and first generation terms)
Stability	Transition	Retardation
Laminar	Flow	Trip
Boundary	Control	Stabilization
Layer	Promoter	Turbulence

is to give a *relevance factor* to a document according to the degree to which it matches the search prescription. Thus, in a five-term search, a document indexed by three of the terms gets a relevance factor, for that question, of 60 per cent, and a document whose index profile includes all five terms achieves a relevance factor of 100 per cent. This principle is the basis of Baker's *latent class analysis*.[45] A more sophisticated approach would be to consider not only degree of match but also the number of extraneous index terms in a document profile. Timberlake[46] has suggested the joint use of two percentage factors,

$$P1 \quad \frac{\text{Number of matches between search and document descriptors}}{\text{Number of document descriptors}} \times 100$$

$$\text{and } P2 \quad \frac{\text{Number of matches between search and document descriptors}}{\text{Number of search descriptors}} \times 100$$

Another obvious method of achieving an ordered output is by *weighting* of terms at the indexing stage to represent degree of importance of each term to the input document. Searching, in such a *probabilistic indexing system*,[47] would, of course, be carried out by means of weighted search terms.

A further contribution to research in the field of automatic syndetics construction is the IBM AMNIPS (Adaptive man-machine information processing system).[48, 49] Users enter both queries and data, through a keyboard console, in a semi-formalized language of subject-verb-object. The memory is conceived of as a graph in which the subjects and objects are nodes and the verbs links between the nodes. The result is a 'growing thesaurus', continually adapted on the basis of new information and searches. Such a system may provide constant feedback to users to allow continuous modification of questions. This problem of man-machine interaction forms the basis of several research programmes, including one on a Multiple Instantaneous Response File.[50]

OTHER USES OF STATISTICAL ASSOCIATIONS BETWEEN TERMS

Doyle[43] proposed that a more useful application of statistical associations would be in the machine-creation of exotic searching aids for subsequent human use. Such a man-machine combination would have the benefit of both statistical associations and 'the highly individual cognitive associations which enable the human searcher to be selective in following statistically associative pathways'. The data from a term correlation matrix would be used in the automatic compilation of a *semantic road map* displaying diagrammatically the strength of associations between terms. The map, which would either be printed out or displayed on a console, can be likened to a microscope which allows the searcher to focus on smaller and smaller portions of the library. Such an association map, derived subjectively rather than statistically, is the circular thesaurus used by TDCK.[51]

Simple statistics on term use and term co-occurrences have been used as searching aids from the earliest days of post-coordinate systems. The use of such statistics as the basis of *file arrangement* is a more recent innovation. The Advanced Information Systems Corporation[52, 53] has proposed a self-organizing file arranged on the basis of use (i.e. the most used terms are the most accessible). Such a file would re-organize itself constantly on the basis of changing usage.

SUPPLEMENTARY ASSOCIATIONS IN DOCUMENT RETRIEVAL SYSTEMS

It may be possible to retrieve groups of subject-related documents by some criterion other than that of index-term similarity. For example, if document A is pertinent to request *x*, there is some likelihood that other documents by the author of A will also be of pertinence. Similarly, later documents which have cited document A are of probable interest, as are documents which have one or more references in common with document A. These last two relationships are the basis of retrieval systems employing *citation indexing*[54] and *bibliographic coupling*.[55, 56, 57]

Both Salton[58] and Giuliano[41] have proposed that an associative retrieval system should take into account document associations other than those based on pure index term similarity. The associations operating in such a system are illustrated in Figure 5.

ECONOMICS OF MACHINE INDEXING

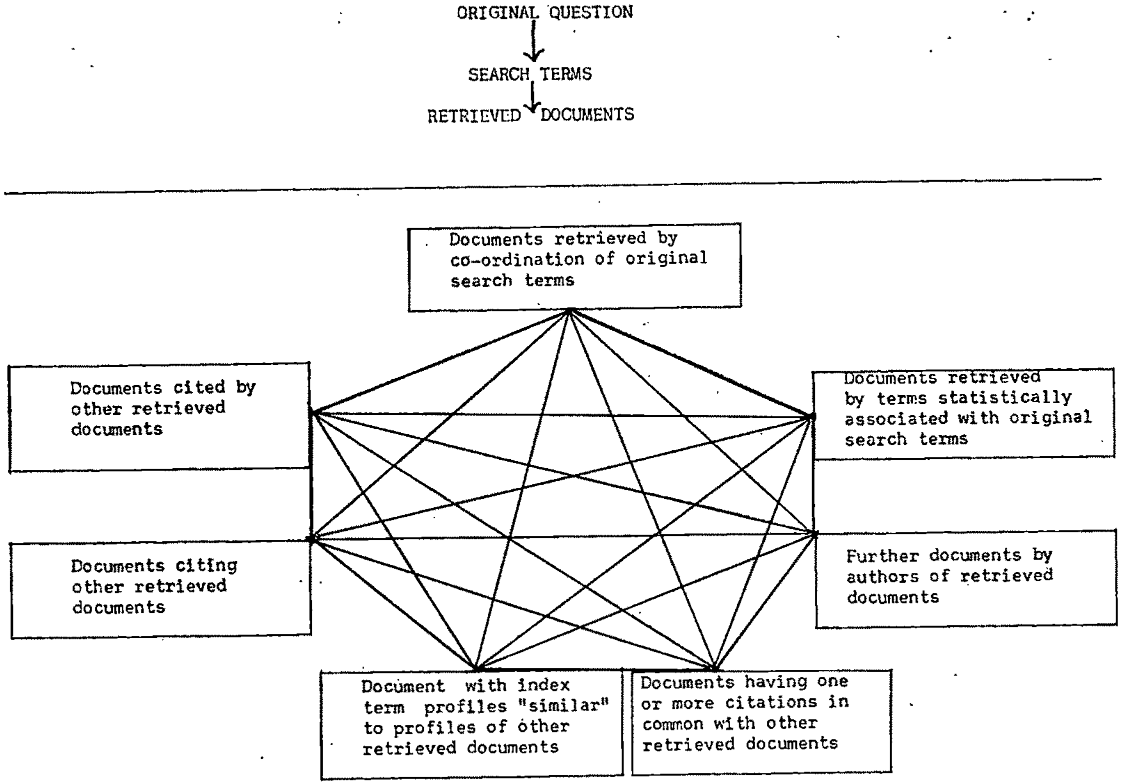
Swanson claims that, once a machine has been provided with the text of a document (keypunching costs are 1 to 2 cents per word), or critical parts of it, in machine-readable form, if the speed for automatic indexing and the cost of computer time is calculated, the result is a cost of something like $1.00 per article for automatic indexing. This is roughly equivalent to a human indexer spending fifteen to twenty minutes on a document. The average cost, in Swanson's experiments, for automatic input was $21.00 per document, of which $20.00 was consumed by keypunching and verification.[10] It is obvious, therefore, that, once a cheap form of input is discovered, automatic indexing and abstracting may become economically competitive with fairly exhaustive human indexing.

CONCLUSIONS

Luhn[59, 60] has envisaged a fully automated information handling system in which the interests of all users, or cohesive groups of users, are stored in the form of lists of terms (interest profiles). All incoming documents are machine

FIGURE 5

Simplified network showing some possibilities for automatic search elaboration


ORIGINAL QUESTION
SEARCH TERMS
RETRIEVED DOCUMENTS
Documents retrieved by co-ordination of original search terms
Documents cited by other retrieved documents
Documents retrieved by terms statistically associated with original search terms
Documents citing other retrieved documents
Further documents by authors of retrieved documents
Document with index term profiles "similar" to profiles of other retrieved documents
Documents having one or more citations in common with other retrieved documents

indexed and abstracted. The index tags are compared with the stored interest profiles and thus potentially interested persons automatically receive either abstracts or complete documents. The feedback of their response to these documents ('relevant' or 'not relevant') is used automatically to update their interest profiles. At the same time the index tags and abstracts are stored for future searching.

This paper has attempted to review some investigations which are groping towards the realization of such a completely automated intelligence system. Much still remains to be done.

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Letter to the Editor

INDEXES TO REFERENCE BOOKS

Dear Madam,

It frequently happens during a search that books which might, or might not, contain the information required are in use elsewhere. As it is out of the question for departmental libraries to hold enough copies of an expensive book to ensure that one will always be immediately available, it would be of great value if publishers of reference books would make available to purchasers at the time of publication extra copies of the index in pamphlet form.

I am requesting our bookseller to find out the views of publishers. If other librarians who would find this useful will make the same inquiry, publishers may well be prepared to print the few extra sheets to sell separately.

It appears to me that this is a useful and easily provided facility, waiting only on the demand.

Yours faithfully,
G. BURGER.

Castrol Ltd,
Research Department,
London Road,
Bracknell, Berks.

SELECTIONS FROM THE RECENT LITERATURE

ALL ITEMS listed may be borrowed from the Aslib Library, except those marked *, which may be consulted in the Library.

Books and Pamphlets

AMERICAN DOCUMENTATION INSTITUTE
Automation and scientific communication: short papers contributed to the theme sessions of the 26th Annual Meeting of the American Documentation Institute at Chicago, . . ., October 6–11 1963, ed. by H. P. Luhn, Washington, the Institute. [© 1963]. 2 v. $10.

AMERICAN LIBRARY ASSOCIATION. American Association of State Libraries
Standards for library functions at the state level developed by the Survey and Standards Committee of the American Association of State Libraries . . . approved by the American Association of State Libraries for the American Library Association, Chicago, ALA, 1963. $1.50.

[AMERICAN LIBRARY ASSOCIATION. Office for Recruitment]
What you need to be a librarian. [New York, the Association, 1963.] Unnumbered paging.

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International subscription agents, compiled by the American Library Association, Resources and Technical Services Division, Serials and Acquisitions Sections, Joint Committee to Compile a List of Subscription Agents. Chicago, ALA, 1963. 84 p. $2.75.

*ASLIB. Research Department
Report of an investigation on literature searching by research scientists, by John Martyn. London, Aslib, 1964. 7*s* 6*d*.

BARNARD, GEORGE W., *and* ABBOT, CARL
Information storage and retrieval: A survey. Ohio, Wright-Patterson Air Force Base, 1963. A study performed by the Psychophysiological Stress Section, Biophysics Branch, Biomedical Laboratory, 6570th Aerospace Medical Research Laboratories, Aerospace Medical Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. $0.75.

BEDDINGHAM, PHILIP, *and others*
Concerning booklabels, by Philip Beddingham, Will Carter and Reynolds Stone. London, Private Libraries Association, 1963. 16 p. diagrs. 5*s*.

BOURNE, C. P.
Methods of information handling. New York, London [etc.], Wiley, [© 1963.] 241 p. $12.95, 100*s*.

COUNCIL ON LIBRARY RESOURCES INC.
Automation and the Library of Congress: a survey sponsored by the Council on Library Resources Inc., submitted by Gilbert W. King [and others] . . . Washington, Library of Congress, 1963. vii,88 p. $2.

DAVINSON, D. E.
Periodicals: a manual of practice for librarians, 2nd ed. London, Deutsch, [1964.] 200 p. 30*s*.

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La Classification Décimale Universelle (C.D.U.) Manuel practique d'utilisation. Paris, Gauthier-Villars, 1964. [8], 211 p. 20F.

*FEDERATION INTERNATIONALE DE DOCUMENTATION
Abstracting services: an index to material collected by FID in 1962/63. The Hague, the Federation, 1963. 102 p. diagrs. mimeog. (FID Publ. 352.) 5 *guilders*.

FROME, JULIUS
Searching chemical structures. Alexandria, Va, US Dept of Defense, Defense Documentation Center for Scientific and Technical Information, 1963. [14] p. mimeog. $1.60.

GREAT BRITAIN. Central Youth Employment Executive
Librarianship, prepared by the Ministry of Labour and the Central Office of Information, 5th ed. London. 1963. (Choice of careers, no.4.) 1*s*.

GREAT BRITAIN. Department of Scientific and Industrial Research
Scientific and technical information in the Soviet Union: report of the DSIR-Aslib delegation to Moscow and Leningrad, 7th–24th June, 1963. [London,] the Department, 1964. iv,44 p.

GREAT BRITAIN. National Institute for Adult Education. *London*
A Classification scheme for adult education: introduction and schedules compiled by Monica A. Greaves, the Institute, 1962. 21 p. mimeog.

[GREAT BRITAIN. Parliament. House of Commons]
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Photocopying from bound volumes. Supplements nos. 1 and 2. Chicago, American Library Association, 1964. 12 p. (LTP publication no.14, suppl. 1 and 2.) $2 each.

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Archives and manuscripts in libraries. 2nd ed. London, Library Association, 1964. 70 p. illus. (LA pamphlet no.18.) 12*s*.

*INTERNATIONAL BUSINESS MACHINES. European Education Centre
Information retrieval. Blaricum, Holland, the Centre, [1964?]. Various paging. A collection of papers co-ordinated by V.F. Serbanescu.

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Quality in translation: proceedings of the International Federation of Translators . . . Bad Godesberg, 1959, ed. by E. Cary and R.W. Jumpelt. Oxford, London, Pergamon Press, 1963. xxiii,544 p. 200*s*.

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Die Vervielfältigung von Katalogkarten. [The reproduction of catalogue cards]. Köln, Greven, 1963. 42 p. DM 5.40.

LAND, BRIAN
Avenues of research: a businessman's guide to sources of business information. Montreal, Canadian Chamber of Commerce, [1962]. 40 p. $2. The use of libraries, reference books, periodicals and pamphlets, government publications and other sources of information is discussed briefly.

LIBRARY ASSOCIATION OF AUSTRALIA
Impact: addresses and papers read before the 12th Biennial Conference at Hobart, Tas., August 20–22, 1963. Hobart, Tas., Conference Committee of the LAA, 1963. Various paging.

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Teaching machines—their promise and problems. London, Presentation of Technical Information Group [1963?]. Group paper given 26th February 1963.

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Guide to the M.E. Saltykov Shchedrin State Public Library, Leningrad: an English translation by Raymond H. Fisher. Los Angeles, University of California Library, 1963. 48 p. (UCLA Library Occasional paper no.14.) $1.

NATIONAL FEDERATION OF SCIENCE ABSTRACTING AND INDEXING SERVICES. 6th Annual Meeting, Washington, 1963
Proceedings . . ., ed. by Raymond A. Jensen, Washington, NFSAIS, 1963. iv,38 p. $4.

*NEDERLANDS INSTITUUT VOOR DOCUMENTATIE EN REGISTRATUUR
Netherlands research guide: a guide to contract research facilities in the Netherlands. The Hague, the Institute, 1963. 200, 30 p. illus.

NIXON, HOWARD M.
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Information retrieval: systems and technology—a literature survey. The Division, 1963. xi,272 p. mimeog. $4.

*PLAY INDEX 1953–1960: an index to 4592 plays in 1735 volumes, edited by Estelle A. Fidell [and] Dorothy Margaret Peake. New York, H.W. Wilson Co., 1963. 404 p. $11.

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How to use your library. [New York, Consolidated Book Service, 1963.] 17 p.

SLAMECKA, V., *and* JACOBY, J.
Effect of indexing aids on the reliability of indexers: final technical note. Bethesda, Maryland, Documentation Incorporated, 1963. Various paging. tables.

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Special librarianship—information at work. New York, Special Libraries Association, 1963. 16 p.

STRUNK, WILLIAM, *and* WHITE, E. B.
The elements of style [in writing]. New York, Macmillan, [1959]. xiv,[2],71 p. $2.50.

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Proceedings of the 3rd Congress of International Congress Organizers and Technicians Rome, 12–15 November 1962). Brussels, the Union, 1963. 111 p. (Union of International Associations. International congress science, vol. 3e). Jointly organized by the Union and the International Association of Congress Centers.

UNITED STATES .Armed Services Technical Information Agency
Controlling literature by automation; [papers] to be presented at the IV Annual Military Librarians' Workshop, . . . 5–7 October 1960, Washington DC. Washington, US Dept of Commerce, OTS, [n.d.] 130 p. mimeog. Papers by W. Hammond and Associates. $10.10.

WESTERN RESERVE UNIVERSITY. School of Library Science. Center for Documentation and Communication Research
The library of tomorrow—today: an information service of education research materials . . . by Pamela W. Reeves, A. J. Goldwyn, Jessica S. Melton and Allen Kent. Cleveland, Ohio, the Center, 1962. 326 p. mimeog.

WESTERN RESERVE UNIVERSITY. School of Library Science. Center for Documentation and Communication Research
Review of a report of the Aslib–Cranfield test of metallurgical literature of Western Reserve University, [by] Alan M. Rees. Cleveland, the Center, 1963. Paper presented at Aslib (semi-privately) on 16th October 1963.

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Microfilm reader-printers: a comparison—capabilities, convenience, cost. *Reproductions Review,* vol.13, no.1, January 1963, p.20–3, 26, 28, 32.

BALLARD, DELBERT L., *and* NEELAND, FRANCES
A computer technique for the retrieval of chemical structures utilizing a special topological cipher. *Journal of Chemical Documentation,* vol.3, no.4, October 1963, p.196–201.

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On a predetermined writing style. *Technical Publications Association Journal,* issue 1, no.3, October 1963, p.5–17.

HAND, HARRY E.
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Some aspects of library planning. *New Zealand Libraries,* vol.26, no.11, December 1963, p.278–80.

HUNGERMANN, E. H.
Was kostet der erste Schritt zur Patentdokumentation? *Nachrichten für Dokumentation,* vol.14, no.2, June 1963, p.73–6.

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The role of international scientific organizations in improving scientific documentation. *Physics Today,* vol.15, no.9, September 1962, p.24–6.

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Canadian libraries and librarianship. *Library World,* vol.65, no.763, January 1964, p.226–32.

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Education for librarianship abroad in selected countries. *Library Trends,* vol.12, no.2, October 1963, p.121–355. This issue of *Library Trends* consists of articles on education for librarianship in UK, E. Germany, Netherlands, Spain, Greece, Czechoslovakia, Poland, USSR, Turkey, Israel, UAR, S. Africa, Japan, Australia, NZ, Latin America.

LE FANU, WILLIAM R.
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Searching X-ray diffraction powder data with an inverted coordinate index. *Journal of Chemical Documentation,* vol.3, no.4, October 1963, p.213–16.

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The Medical Library Center of New York: an experiment in cooperative acquisition and storage of medical library materials. *Bulletin of the Medical Library Association,* vol.51, no.4, October 1963, Part 1, p.501–6.

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Keeping records for patent purposes: some remarks which might be made to scientists and engineers. *Journal of the Patent Office Society,* vol.44, no.7, July 1962, p.462–71.

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The effect of mechanized searching on patent practice and litigation. *Journal of the Patent Office Society,* vol.44, no.12, December 1962, p.803–17.

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A linear notation for organic compounds. *Journal of Chemical Documentation,* vol.3, no.4, October 1963, p.189–95.

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From boxroom to bibliotheca. *Patra Journal,* vol.3 (new series), no.2, April 1962, p.8–11. Describes the growth of Patra Library.

THOMPSON, LAWRENCE S.
The libraries of colonial Spanish America. *Library Binder,* vol.11, no.2, December 1963, p.6, 9–10, 12–13.

TURNER, D. M.
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[UNIVERSITY and college libraries]
Library Journal, vol.88, no.21, 1st December 1963, p.4558–85. Discusses the library buildings.

VANN, JAMES O.
Defense Documentation Center (DDC) for Scientific and Technical Information. *Journal of Chemical Documentation,* vol.3, no.4, October 1963, p.220–2.

WEISS, DUDLEY A.
Library binding in the age of science. *Library Binder,* vol.11, no.2, December 1963, p.14–17.

MEMBERS' ADVERTISEMENTS

The charge for advertisements in these columns is 4*d* per word, minimum 5*s*. An additional charge of 6*d* is made for the use of a box number.

ABILITY AND SERVICE. Technical or commercial translations into/from Dutch and German. Speller-Kuijpers, FIL, NGV, 6 Lakeside, Ealing, London W13. ALPerton 1C45.

WILFRED E. GOODAY, ARSM, DIC, MIMM, FIL. Member of Translators' Guild. Rumanian and French. 161 Rivermead Court, London SW6. Renown 1912.

TRANSLATIONS FROM TURKISH. All subjects. F. P. Scott, 4 Uphill Grove, Mill Hill, London NW7.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. STAmford Hill 8564.

Appointments vacant

BRIGHTON EDUCATION COMMITTEE. BRIGHTON TECHNICAL COLLEGE. Liberal Studies Department. Applications are invited for the following post from September 1964: LECTURER for LIBRARIANSHIP, for both Part I and Part II Examinations. Full details of post and salary scale, together with application form from The Principal, Brighton Technical College, Richmond Terrace, Brighton 7, to whom it should be returned within ten days from the date of advertisement. W. G. Stone, Director of Education.

THE ELECTRICITY COUNCIL invite applications from suitably qualified persons for the post of LIBRARIAN in the Intelligence Section. The Librarian will be responsible to the Head of the Section for the day-to-day running of the Library, which is at present on a small scale, mainly concerned with the administrative and commercial aspects of electricity supply. The work will involve reorganizing the existing service and expanding it in particular in the fields of economic and market research, electricity tariffs, new applications of electricity and similar questions, in close co-operation with the specialist departments concerned. Applicants should desirably have a librarianship qualification and have had suitable professional experience as a special librarian in industry. A University degree preferably in economics, or equivalent qualification, would be an advantage. The salary will be within the scale £1,400–£1,795 per annum inclusive. Applications stating age, present position, salary, qualifications and experience should be forwarded to the Assistant Secretary (Establishments), The Electricity Council, 30 Millbank, London SW1, by 30th April 1964.

THE ROYAL COLLEGE OF SCIENCE AND TECHNOLOGY, GLASGOW. The Andersonian Library (Second Advertisement) SENIOR ASSISTANT LIBRARIANS. Applications are invited from honours graduates with Librarianship qualifications, preferably experienced in the field of science and technology. Lecturing ability on all aspects of information retrieval and a capacity for readers' adviser work essential. Salary scale £1,250 × £60–£1,670 × £80–£2,150 with F.S.S.U. and family allowances. Forms of application from the Secretary, Royal College of Science and Technology, George Street, Glasgow, C.1.

ASSISTANT required in Library to undertake the preparation and editing of abstracts. Permanent post, hours 9.15 a.m. to 5.15 p.m. Monday to Friday. Salary scale £600 to £780. Applications stating qualifications and experience to The Secretary, Timber Research and Development Association, St John's Road, Tyler's Green, Penn, High Wycombe, Bucks.

ASLIB CATALOGUER required for the Library. The material held covers librarianship and documentation and is classified by UDC. Library qualifications desirable. Starting salary in the range £750–£1,050 depending on qualifications and experience, 5 day week. Written applications giving particulars of age, qualifications and experience should be sent to the Director, Aslib, 3 Belgrave Square, London SW1, within fourteen days.

LIBRARIAN required for small library. Duties include some secretarial work. Shorthand/typing essential. Hours 9.15–5.15. No Saturdays. Three weeks' holiday. Luncheon vouchers. Salary by arrangement. British Road Federation, 26 Manchester Square, London W.1.

Wanted

JOURNAL OF THE CHEMICAL SOCIETY, 1925; 1928; 1930; 1932–33; 1935–37. Replies to Librarian, Givaudan SA, Vernier-Genève, Switzerland.

MINISTRY OF LABOUR GAZETTE, Index, 1950; March, September, Index, 1951; January–May, Index, 1952; September, 1953; March, 1954; September, 1955; July, 1962; August, 1963. Librarian, Institute of Economics and Statistics, St Cross Road, Oxford.

PHYSICS ABSTRACTS, November 1956. Technical Librarian, Plessey Co (U.K.) Ltd, West Leigh, Havant, Hampshire.

For Sale

For disposal—bound volumes of *The Economist,* vol. 169–188 (1953–1958); *Nature,* vol. 162, 164, 166–180 (1948–1957). Any offers to The Technical Information Officer, Wiggins Teape Research & Development Ltd, Butler's Court, Beaconsfield, Bucks.

FOR DISPOSAL, Autumn 1964. Offers are invited for: fifty-one bays wall shelving and seventeen bays island shelving in oak, Tonks adjustable, new in 1952; 64 ft. run of children's library wall shelving in light oak, Tonks adjustable, new in 1953; fifty bays wall and thirty-seven bays *Simplex* steel shelving in olive green and cream (cream shelving all new since 1960); large quantity older timber shelving which could be re-erected for storage purposes; circular library tables; museum showcases, etc. To view write: Chief Librarian, Central Library, Finchley Road, Hampstead, NW3.

Aslib Proceedings

incorporating Aslib Information

Memorandum for Presentation to the Committee on Social Studies

ASLIB STATEMENT

The Production of Library Publications

S.B.PAGE

CALCUTTA UNIVERSITY CENTRAL LIBRARY

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Aslib Proc. vol.16 no.5 p.159-182 London, May 1964

"I NEVER APOLOGIZE"

ARMS AND THE MAN

Everyone makes mistakes. Even bookshops.

EVEN BLACKWELL'S.

But not absolutely *everyone* apologizes for them. Overheard on a bus: ". . . and you'd have thought they'd say 'sorry' after sending Jane Austen's Sense and Sensibility instead of J. L. Austen's Sense and Sensibilia, but no . . ."

IT WASN'T BLACKWELL'S.

Luckily, there *are* bookshops that have no false pride in this matter. They don't *like* making mistakes. In fact, they'd do anything to avoid them. But if an error has happened, mea culpa, mea culpa, mea culpa . . .

SAYS BLACKWELL'S.

On the whole, people who apologize are easier to deal with than people who don't. (That character in Arms and the Man was tiresome, and deserved to marry the servant instead of the heroine.) They're more friendly, more human

LIKE BLACKWELL'S

—and, in the end, more *efficient*. If you admit and regret your mistakes, you learn not to make them again. At least, you *try* not to.

BLACKWELL'S ARE STILL LEARNING,
UNASHAMEDLY.
ANY TIME YOU LIKE TO DROP IN
AND TELL THEM SOMETHING
'FOR THEIR OWN GOOD'
THEY'LL—
YES, THEY WILL BE PLEASED TO SEE YOU

BLACKWELL'S BROAD STREET OXFORD

CALCUTTA UNIVERSITY CENTRAL LIBRARY

ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 May 1964 Number 5

ASLIB CALENDAR 1964

May

WED.20. Evening meeting at Aslib, 5 for 5.30 p.m. 'O & M in the special library', by E. H. E. Jones.

SAT.23 – SUN.24. Engineering Group conference at Leamington Spa.

TUE.26. Advanced course on patents.

June

TUE.2. The evening meeting previously announced has had to be postponed because of the illness of Mr Agard Evans.

FRI.5 – SUN.7. Electronics Group annual conference at Ashridge College.

WED.10. Annual General Meeting at Aslib, 12 noon.

WED.17 – FRI.19. Course on photographic copying in the information department. See paragraph below.

MON.22. – FRI.26. Repeat of senior introductory course to special library and information work. See paragraph below.

September

MON.28 – THUR.1 October. 38th Annual Conference at University of Exeter.

Senior Introductory Course

The senior introductory course to special library and information work held from 4th to 8th May was so popular that it was not possible to accept all the applicants. The course is consequently to be repeated from Monday 22nd to Friday 26 June, and it will be possible to take a few students in addition to those who could not be accepted for the previous course. Students should be graduates, in their first year of information or library work, or more mature persons put into responsible positions in libraries or information departments without previous training or experience. Details of the programme and entry forms can be obtained from the Education Officer, Aslib. The fee for the course is £10.

Photographic Copying in the Information Department

A course for library and information assistants engaged on photocopying work will be held by Aslib from Wednesday 17th to Friday 19th June. It will take place at the South-East Essex College of Technology, Dagenham. As well as being introduced to the basic principles of photographic copying, students will be given a chance to see and discuss a wide range of the most up-to-date equipment, and to use it under instruction. The fee for the course will be 6 guineas. A full programme is enclosed in this issue, and application should be made to Aslib on the form provided. As numbers are strictly limited, students are advised to apply early. Provisional bookings will be accepted by telephone or telex.

Information Work as a Career

A pamphlet on *Information work as a career* has been prepared under the auspices of the Aslib Education Committee and is being distributed to appropriate institutions. It is aimed at interesting young people, especially those at universities, in the possibilities of a career in information work. Any member who would like copies of this pamphlet for recruiting purposes or is interested in seeing it may obtain copies from the Education Officer at Aslib.

Scottish Branch

The Scottish Branch Conference was held in Glasgow on Friday 20th March, and was very well attended. Members heard two excellent papers on 'The production of library publications', by Mr S. B. Page, M.A., A.L.A., Assistant County Technical Librarian, Hertfordshire, and Mr K. Boodson, A.L.A., Librarian, Imperial Metal Industries. There was lively discussion and on the motion of Mr R. J. Cruickshank an enthusiastic vote of thanks was accorded to the speakers.

At the Annual General Meeting of the Branch the following were elected: Chairman, Mr R. N. Beer; Vice-Chairman, Mr H. Greenshields; Hon. Secretary, Mr W. H. Rutherford; Hon. Treasurer, Mr J. R. K. Pirie; Branch representative on the Executive Committee of the Scottish Central Library, Mr R. Hindson; Committee, Mr W. H. Brown, Mr J. W. Cockburn, Mr H. MacLachlan.

Aeronautical Group and Chemical Group

The joint Annual Conference at Cranfield was attended by ninety-eight delegates. The programme opened with a very amusing account by Mr Frank Smith of his visit to the United States. On Friday morning Mr D. V. Arnold gave valuable guidance on the changes necessary in the organization of an information service as that service grows; and Mr Michael Keen gave a clear explanation of the mysteries of citation indexing and bibliographic coupling. After lunch there was an interesting talk on the Defense Document Center Thesaurus by Mr Paul Klingbiel. The technical lecture was presented on Saturday morning by Mr McMullen, on the properties of reinforced plastics and their uses in rockets and aircraft. This was followed by a description of the Corrosion Index at the National Chemical Laboratory by Miss D. M. Brasher. The conference concluded with an admirable paper by Mr Marvin McFarland on the National Referral Center at the Library of Congress.

At the Annual General Meeting of the Aeronautical Group the following were elected as officers for 1964–5. Officers: Chairman, Mr J. S. Rosser; Hon. Treasurer, Mr P. H. J. Massingham; Hon. Secretary, Miss M. Dyke. Committee: Mr A. R. Andrews, Mr T. I. Bell, Mr T. H. Harden, Miss E. H. Ridler, Mr J. K. Spencer, Mr P. Whitehead; and as *ex officio* members, Mr T. M. Aitchison, Mr C. W. Cleverdon, Mr A. H. Holloway, Mr F. H. Smith, Mr R. C. Wright.

Chemical Group

The joint conference with the Aeronautical Group was the first conference the Chemical Group has held. Twenty-five of its members attended, and for many of them it was also their first visit to Cranfield.

The Annual General Meeting was held during the week-end. The Officers and Committee for 1964–5 are as follows: Chairman, Mr E. F. Broome; Hon. Treasurer, Miss M. Hocking; Committee, Mrs K. Bourton, Mrs M. A. Ferrie, Dr L. A. Goodson, Mr J. G. Hall, Mr J. A. Hanson, Mr J. S. Rippon.

Members who have any suggestions for future activities of the Chemical Group should get in touch with the Chairman, Mr Broome, at Beecham Toiletry Division, Beecham House, Great West Road, Brentford, Middlesex. New members will be very welcome. They should apply in the first instance to Mrs R. L. Sauvée, Liaison Officer at Aslib.

New SLA Publication

Under its agreement with the Special Libraries Association, Aslib is handling sales of a new SLA publication, *Picture sources*. This is the second, expanded, edition of a directory originally published in 1959. There are 703 entries, describing library, government, industrial and other sources of pictures in many categories and subjects. Information includes address, name of person in charge of collection, size and type of material, and subject and dates covered. The range of material includes photographs, transparencies, postcards, lithographs and prints. Alphabetical and geographical lists of sources have been added to this edition, and thirty-three sources outside North America are covered. Copies of *Picture sources* may be ordered (for the United Kingdom and Europe) from Aslib, 3 Belgrave Square, London SW1, price 49*s* a copy plus postage and packing.

Industrial Film Festival

The fifth International Film Festival will be held in London from 2nd to 6th November 1964. It is being organized by the British Industrial Film Association under the auspices of the Council of European Industrial Federations (CEIF). The Festival is intended to provide an opportunity for sponsors, producers and users of industrial films to see an international selection of the best films produced by industry and commerce in many countries. Further information may be obtained from the Director, 5th International Industrial Film Festival, Durrant House, Chiswell Street, London EC1 (telephone National 5555).

Foreign Language Needs of Industry

In October 1963 the Federation of British Industries set up a Working Party to consider the information collected since the publication in 1962 of a report on *Foreign languages in industry*. An interim report entitled *Foreign language needs of industry* has now been issued, for consideration at an FBI conference for 'providers' and 'users' of language courses on 8th May. The aim is to give guidance to firms on facilities available for language learning and the methods involved. A final report will be issued after the conference. Inquiries should be addressed to the Federation of British Industries, 21 Tothill Street, London SW1 (telephone Whitehall 6711).

Scientific Information Courses

In response to the increased demand for training in information and documentation (stimulated by the Weinberg Report), a concentrated programme of courses is being offered for the first time by the Center for Documentation at Western Reserve University. The courses will take place between 15th June and 1st August and will cover documentation, information retrieval systems and theory, automatic language processing, and research in information retrieval. Details may be obtained from the Director of Admissions, Western Reserve University, Cleveland, Ohio, USA.

Classification Society

The Classification Society proposed last autumn (see *Aslib Proceedings*, vol. 15, no. 10, October 1963, p. 276) was formally set up at a one-day conference held at Aslib on 17th April. The Society has its origins in the conference reported in *Aslib Proceedings* for August 1962. Its intention is to hold occasional meetings to discuss the theory and practice of classification in different disciplines and to publish a bulletin (probably twice a year) abstracting papers and giving information relevant to the Society's interests.

The Officers of the Society are as follows: Chairman, Mr E. R. Leach, Reader in the Department of Anthropology, University of Cambridge; Secretary, Mr J. S. L. Gilmour, Director, University Botanic Garden, Cambridge; Editor of the Bulletin, Dr P. H. A. Sneath, National Institute for Medical Research, Mill Hill. Inquiries and applications to join the Society should be addressed to Mr Gilmour, at the University Botanic Garden, Cambridge. The subscription is 20*s* a year.

ASLIB

MEMORANDUM FOR PRESENTATION TO THE COMMITTEE ON SOCIAL STUDIES

THE TEXT that follows was submitted by Aslib to the Committee on Social Studies in March 1964 in response to an invitation received from the Assistant Secretary of the Committee for comments and evidence from research organizations. The Committee on Social Studies was set up in 1963 under the chairmanship of Lord Heyworth. Its terms of reference are 'To review the research at present being done in the field of social studies in government departments, universities and other institutions, and to advise whether changes are needed in the arrangements for supporting and co-ordinating this research'.

1. The documentation needs of the social sciences

The view is widely held, among both social scientists and those responsible for library and information services in the natural sciences and technology, that facilities for dissemination, control and exploitation of knowledge resulting from social studies are much inferior to those which have been developed in relation to science and technology. There are numerous reasons for this, among them the following: the social sciences that use the scientific method and require the support of documentary services as swift and reliable as those needed in science/technology are relatively young; the subjects studied are often interdisciplinary in extent and their vocabulary is less precise and uniform than that of science, so that standardization of terminology and systematic control of literature are harder to achieve; the social sciences generally receive less of the funds available for research than science and technology, which at present enjoy greater prestige and appear more often to have a saleable end-product; many social scientists are themselves unaware of the extent to which information services could relieve them of time-consuming work.

The fact that it has been found necessary to evolve such extensive documentation services in science and technology does not, of course, constitute proof of a similar necessity in the social sciences. Nevertheless, many types of organization are, for a variety of reasons, beginning to feel a positive need for access to systematically organized information beyond what is at present available. Commercial and industrial concerns and international development agencies, for example, are finding that production, sales and staff welfare, both at home and overseas, only flourish when the *mores,* ideologies and social history of customers, workers and citizens are understood, and governments are discovering the need to base social legislation on established facts rather than on the hunches of experts. Further, the dissemination and systematic recording of research results, with accompanying data and evidence, are even more important in some of the social sciences than in science and technology because, by their very nature, surveys and investigations cannot be repeated in laboratory conditions. There is also no reason to suppose that the social sciences are any more free than science and technology from duplication of research and waste of money caused by lack of knowledge of work already completed.

In deciding what action should be taken there are both short-term and long-term needs to be considered. First, it is necessary to ascertain precisely what are the documentary needs of the social sciences and how far the existing provision fails to meet them; experience in science and technology will be useful, but it cannot be assumed that direct parallels will be either possible or desirable. Aslib is itself planning to hold a small working conference in the autumn of 1964 for the purpose of ascertaining from a group of social scientists the extent of their use of, and satisfaction with, existing services and their probable response to services which might be offered. However, for long-term planning, more far-reaching research is likely to be required. Thereafter, it would be necessary to set about the introduction of such services as this research showed to be needed. At present no organization has clear responsibility for ensuring that the research is undertaken or that any new services which it may indicate are introduced. Since efficient documentation is basic to all the social sciences, and may be a significant factor in limiting unnecessary expenditure incurred through unwitting duplication of work, it is considered that the matters referred to above would merit high priority in plans for the development of social studies.

2. Communication of specialized knowledge as a social science

The range of activities involved in the communication of specialized knowledge can themselves be properly regarded as a branch of the social sciences. They include primary publication; secondary publication, e.g. abstracts, indexes and bibliographies, collection, storage and control in libraries, often including translation and reproduction; and dissemination to the specialist user. No branch of Government has responsibility for ensuring that adequate funds are available for the development of new techniques throughout this range. In relation to the communication of scientific and technical knowledge, DSIR is now providing increasing funds for research and development, but assistance is similarly needed in relation to the social sciences and humanities.

THE PRODUCTION OF LIBRARY PUBLICATIONS

S.B.PAGE, B.A., A.L.A.

Assistant County Technical Librarian, Hertfordshire

Evening meeting, London, 21*st November* 1963, *and Scottish Branch Conference, Glasgow,* 20*th March* 1964

I AM using the word 'publications' in a broad sense, to cover the many bits of paper with inscriptions on them which are produced in quantity and distributed to the library's public. Most of them are book lists of one kind or another —subject lists, bibliographies, reading guides, library bulletins and the like—but there are other categories too, such as recruitment material, leaflets on the use of the library, plans of the library, annual reports, and even the miscellaneous forms used by or to the public.

Library publications of all types, in all kinds of library, have a purpose either in recruiting readers or in keeping them. They are a form of sales literature: they sell the library, its goods and its services. This applies even to publications like bibliographies which have ostensibly some other object; and if we see them in this light, we must apply some of the principles of sales psychology. We must have a publication which has an impact, plus a follow-through. We must produce a publication which makes the potential reader want to pick it up, *impels* him to pick it up and look at its contents, and makes him want to continue reading. We must therefore consider the visual design of the publication: its cover must be attractive, and the print and layout clear and pleasing to the eye. We must consider too the use of illustrations, not only those that are of value to the text but those that are included merely to lead the attention on. In emphasizing such features, I am not denying the importance of editorial considerations: the choice of wording for the cover and headings, the arrangement of the contents, their usefulness, the language used in the presentation, and so on; but these matters are beyond my brief for this occasion.

A second generalization I shall make for the purpose of this talk is that we want to produce our publications on a limited budget. For this reason and no other I am excluding the commercially printed publication and concentrating on do-it-yourself production methods (which are also available commercially, wholly or in part). In the main, this means duplicating methods: spirit duplicating (or the liquid hectographic process); stencil duplicating; and offset lithography, of the scale known as 'small offset'. For short-run work—book lists in ten, twenty or thirty copies—two other methods must be added: diazo (the cheapest photocopying process) and 'infra-red sublimation'. I am sure you have never heard of this term; it is an attempt to find a name for a process which has not got one and is defined by the papers used. A master, prepared in a suitable ink on a paper called by its makers Type A or another, Type Delta, is fed together with a sheet of paper Type B or Type S through an infra-red copying machine. The Thermofax Model 31 is designed for the job, but other Thermofax copiers and heat copiers of other makes can be used. Under infrared heat a substance from the back of one type of paper is sublimated and reacts with a substance on the front of another, producing a duplicate image. One master will produce twenty-five copies, or more with some skill; and a Type A master can be used to generate a series of Type Delta masters each of which will produce a quota of copies.

The other duplicating methods are sufficiently well known to need no description here, and I shall confine my discussion to the making of the copy from which all the other copies are produced and which I shall call a master. The making of a direct master—one produced by typing or handwriting on a special material—does not require any great expertise but needs more care than it usually gets, particularly in such details as typing pressures.

The paper used for *diazo* masters must be very translucent, and the image on it highly opaque to ultra-violet light. Certain colours in the yellow/brown range possess this opacity, but in normal usage it is customary to use a dense black. Special typewriter ribbons are sold for the purpose, but an ordinary typewriter ribbon will do if it is heavily inked. If the ribbon is at all worn, a piece of carbon paper face-up behind the master will give the necessary density to the image. Pencil and pen work should similarly be very black, and black is essential too for the *infra-red* copying process.

Spirit duplicating requires an alcohol-soluble dye on the back of the master. It is transferred there by pressure from a dye sheet, commonly called a hectographic carbon, or from a hectographic typewriter ribbon in a typewriter which has the facility of feeding a ribbon behind the paper. Changing the dye sheet during the making of the master enables up to seven different colours to be duplicated simultaneously. Transfer of dye is improved by the use of a special backing sheet. Since the image on the front of the master has no bearing on the quality of copies, any typewriter ribbon, even a worn one, can be used for this. *Stencil* duplicating requires the displacement—not removal—of a substance commonly called wax from a fibrous sheet covered with it (a stencil). This is done in a typewriter with the ribbon disengaged, or through a cellophane ribbon, which keeps the typeheads clear of wax. For line work there is a wide variety of scribing tools (ordinary writing instruments are liable to cut the fibre) and there are special stencils, with dark coating, to enable work to be seen in progress. *Offset* masters—paper ones for short runs, plastic ones for medium runs and metal ones for long runs—require a greasy image, which again requires a suitable typewriter ribbon or ink.

The versatility of all duplicating processes, however, depends largely on the methods of making indirect masters ('intermediates'); that is, preparing an image separately (an 'original') and transferring it to a master by photographic or other facsimile copying means. There are a number of very strong reasons for preferring an indirect master to a direct master. The original is prepared on ordinary paper, which can be more easily written on or typed on than any of the master materials. Layout is a matter of cutting out chunks of paper and fixing them in their right positions with a slow-drying adhesive; there is no need for a laid-out draft. The less rough bits of rough drafts can be cut out and used, retyping only when a substantial change is wanted. Errors can be corrected by typing the corrected word in the margin, cutting it out and gumming it over the incorrect word. Headings, prepared by headlining devices or cut from letterheads or other publications, can be pasted in. Line illustrations can be incorporated without difficulty; and in some instances half-tones are possible. With some processes, reductions in size can be made, with substantial savings in paper for bulk copying. Most important of all, if the matter to be duplicated already exists in print or photographable legend of any sort, it can be transferred to a master without any further typing or checking. One important application of this is the preparation of book lists by photographing library catalogue cards. Cards carrying headings can be fed into the sequence. The cost savings are considerable, though the results are often sub-standard in appearance (there always seem to be some cards typed in pastel grey!). Other applications include the preparation of new editions of bibliographies by stripping in new entries into earlier editions; and the making of lists from strip indexes.

Translucencies for diazo can be made by most photocopying processes. It is merely a matter of substituting a translucent material for the copying paper normally used. Translucent materials suitably coated are often relatively expensive. There is also one method where no special material is required: the direct-positive photocopying process with the copy made reverse-reading and fed into the diazo machine facing the diazo paper.

Spirit duplicating has attained new dimensions with the introduction of different methods of making indirect masters. There are several machines for doing it by the infra-red transfer process, and two ways of employing diffusion transfer photocopying. Some of the methods must be regarded as being still in a stage of development.

Indirect masters for stencil duplicating may be made photographically, using stencils with a coating of a photo-sensitive emulsion in gelatine in place of wax. This type of stencil has been largely superseded by the 'electronic' stencil, which is cut in a special facsimile-transmission machine. Copies of an exceptionally high quality can be had from these stencils, even from half-tone originals. Photographic and electronic stencils are much more expensive than indirect masters for the other duplicating processes, and their use merely to simplify make-up and layout is out of the question. Catalogue card montages can be copied by the photographic but not the electronic method; and the photographic stencil can be made with a camera, allowing size reduction economies which in very large runs may offset the cost of the stencil. Both types of stencil can be had cut to order at an even higher cost, from the stencil duplicator firms. Cheaper and simpler methods are on the way; before long we shall probably be able to make stencils by infra-red transfer and by diffusion transfer photocopying.

For offset duplicating, there is a bewildering variety of master-making methods to choose from, and within a single method there is sometimes a wide range of materials, on the choice of which depend the cost of the master and the number of copies it will produce—from fifty to five million. The introduction of cheaper master materials to processes which were once the more expensive has brought all the office master-making methods within a narrow price range; none of them costs more than a few shillings a master. You will, of course, pay much more if you have your masters made outside the organization; the professionally made plate will be of better quality than the one you make yourself, but for straightforward originals not appreciably so.

The best quality offset masters, and the highest in cost, are those made by true photography, exposing a photo-sensitive offset plate through a negative. Pre-sensitized masters of many varieties and qualities are available, and you can even sensitize your own with a wipe-on coating. Good contact between negative and master is necessary, preferably in a vacuum light-box. The negative, which may be on translucent paper or film, may be made in contact-exposing apparatus, but a process camera produces the best results, and enables size reductions to be made. Negatives of different reduction ratios can be spliced together. There is also a special stencil (of wax-stencil variety) for use as a negative. There are other types of pre-sensitized master which work from positive translucencies—made in all the ways used for making diazo translucencies—and others which work from a positive image projected on to the master.

Most of the photocopying processes, but not all the machines, used in libraries and offices are capable of producing offset masters. In some machines the contact on exposure is not good enough, and in others the conveying mechanisms used in processing will not cope with a metal master. These matters are particularly important in the choice of a machine which utilizes the diffusion transfer process, a method widely used for making offset masters because the outlay on equipment is small. The technique is similar to that of making an ordinary photocopy, but is a little tricky as to exposure times and the rate of peeling apart transfer paper and offset master. For size reductions, the transfer paper may be exposed through a camera.

The gelatine transfer process will also produce a master. The well-known Verifax machine has been superseded by the Ektalith, which uses a camera. If no darkroom is available, the materials can be handled in an ingenious lightproof cassette system. The masters made by this process are cheap and quite good in quality, and proof copies can be made from the same matrix. The Verifax, incidentally, has come back into the field in another direction: the new fine-line matrix, used for making single copies of high definition, can be washed in water to become a negative to be used with pre-sensitized offset masters.

Xerography finds one of its principal applications in the making of offset masters, which are low in price and reasonably good in quality. The Xerox 914 is sometimes used for this purpose, but more generally the larger models, especially the 1384 with a camera, are used, because the manual processing enables better control over quality as well as cleaning up and deletions. Master-making by the Electrofax process—where the offset master is electrically charged—is still in its infancy in this country, but is being widely used overseas. The only equipment available here at present is cumbersome and cannot compete with xerography, but some of the electrostatic copiers for general office use are expected to be available shortly with offset master-making adaptations. The Apeco copier manufacturers claim that any ordinary copy can be used as an offset master, but the number of offset copies obtainable this way is limited.

Heat copying processes produce the cheapest and quickest masters of all, but their quality is such that offset copies often look like spirit duplicated copies. The Thermofax master, which could be made in a few seconds, has been withdrawn from the market, but masters can be made with infra-red transfer machines.

There are also several master-making methods not related to photocopying. The most promising of these is a facsimile master-cutting machine, similar to the machine used for making electronic stencils.

The point I have been trying to make in this necessarily skimpy outline is that all duplicating processes can be made more versatile than is generally realized. A great deal more could be said about exploiting the capabilities of any available equipment. But if a librarian is able to buy machines especially for the job (as he should, for this is a very important job) which duplicating process should he adopt? In the light of the assumptions made at the beginning of this paper about the appearance and impact of a publication, I should choose offset. It is best for clarity of definition, for quality in the reproduction of illustrations, and especially for colour work. Stencil duplicating, using a good typewriter and electronic stencils for illustrations, with preferably a two-cylinder, silk-belt duplicator, runs second.

From an economic point of view, offset again scores over stencil duplicating. A blank master for typing is cheaper than a stencil, costing as little as twopence, and is cheaper in labour to prepare. The methods of making indirect masters for offset are all very much cheaper than the making of photographic or electronic stencils, and offset copies can be run on cheaper paper than the absorbent paper used for stencil duplicating. There are some snags in the use of offset, however. It requires a higher capital outlay. The cost of offset machines begins where that of stencil duplicators leaves off (£300 or £400); a really good machine, capable of all the things I am demanding of it, costs over £1,000. A second point to consider about offset is that it requires a skilled operator. He need not be a professional printer, and he can acquire most of his expertise with experience, but the offset duplicator is not as a rule a machine which can be run by any girl in the office. And, as a complicated piece of machinery, it has more things to go wrong from time to time.

Diazo is economic for runs of up to twenty copies; infra-red sublimation, with the new cheaper papers, costs about the same. Spirit duplicating is competitive with these, but comes into its own for editions of from ten to one hundred copies, in which it is cheaper than stencil duplicating. Systems offset machines, with automatic washing of blanket cylinders and changing of masters and inking up, are economic in this range too. Offset machines specifically designed for short runs are, however, much less versatile than standard offset machines.

The rest of what I have to say is governed by my predilection for offset, but much of it applies to other duplicating methods as well. Offset is a printing process, although the professional printer may not think so. With a good photographic master, an offset copy will look like a relief-printed copy provided the original looks like relief printing. Of course with the cheaper offset machines the quality may be a little inferior, and equality may take more effort than it is worth, but to the normal reader's eye the likeness is near enough. The question is how to make the original look like relief printing. The obvious answer is to have it relief-printed, that is, have the type set and a single copy relief-printed for photographing on to an offset master. Alternatively the negatives can be made in a photocomposing machine. These methods are in common use, especially in America, but the cost is in the region of commercial printing.

The next best thing is to use a typewriter as a composing machine; a typist costs a lot less than a compositor. To produce results looking like printing, a typewriter must have a typeface similar to one used in printing, must be capable of consistently even and sharp impressions, must allow the justification of the right-hand margin, and must have proportional spacing (m's wider than a's, a's wider than i's). You will find all of these features only in the more expensive electric typewriters, and if you are doing a reasonable amount of publication work it is worth investing in a machine especially for the job (it can be used for other chores as well). But even with cheaper typewriters and portable ones, suitability for publication work is worth taking into consideration when a choice is being made.

Of first importance is the selection of a typeface. There are now dozens of typefaces available, in addition to the traditional pica and elite which brand a copy as 'typed'. Shaded faces (downstrokes thicker than upstrokes) were introduced especially to give a printed appearance. But the thicker the strokes, the less the versatility of the typewriter; performance in cutting stencils and making carbon copies becomes poor. The present tendency is to make the shading slight, and to concentrate on variations in the shapes of the letters. Proportional spacing is only available on electric typewriters (the IBM Executive and Underwood Raphael). I think the importance of proportional spacing is grossly overrated, but there is no doubt that with most typefaces on non-electric typewriters the m's and w's clutter up the look of a page. The extra space taken by narrower letters on non-proportional typewriters is less conspicuous. An ingenious attempt to make these fill more space can be seen in Gayton type (Imperial typewriters), in which i's and l's are provided with hook tails.

There is also quite a wide selection of type sizes to be had, but the majority are still based on the traditional pica and elite. Pica is a 10-pitch type, ten letters to the inch horizontally; elite is 12-pitch. There is a corresponding difference in type height, but both type sizes run at six lines to the inch vertically. There is less space between the lines with pica, and in a large block of type it looks rather congested. A more spacious effect is commonly obtained by leaving a line of space between each line of type (three lines to the inch). This is costly, but on most modern typewriters it is possible to leave half a line of space, giving four and a half lines to the inch. Some of the typefaces of pica size achieve a slightly more spacious effect in solid-line setting by providing shorter risers to letters such as b and p.

Pica as a type size is fast going out, because of the paper economy possible with elite. To take an example: if we use a sheet of quarto paper and allow a margin of one inch at the left and right sides and an inch and a quarter at the top and the bottom, we are left with a typing area of 6 × 7½ in. Some simple mathematics will show that the forty-five six-inch lines have a maximum capacity of 2,700 letters in pica, 3,240 letters in elite; i.e. the use of elite in preference to pica would save one page in every six, a large saving in terms of multiple copying. Another cost factor to be considered is that this typical margin area occupies almost half the paper.

Considerable further economy can be had by using even smaller sizes of type, without much effect on legibility. Typewriters are made with 14-, 16- and even 20-pitch type. As a general rule midget types are not easy to reproduce; the m's and other tight letters rapidly fill with dirt and ribbon fluff and need more frequent cleaning than the average typist will give them, and if the method of master-making is not a high-precision one they will fill up anyway. A much more satisfactory way of producing small type is to use pica or elite size and reduce it photographically. Elite can comfortably come down to 85 per cent of its size for general use, and down to 75 per cent for minor sections of the text. Reducibility is not solely a function of size, however; the design of the type face chosen is important. Size reduction is now such common practice that many electric typewriter faces, especially those of the IBM Executive, are made considerably larger than pica size. Miniature types and much reduced types must be used in short lines, or they are fatiguing to read.

One disadvantage of typing as against printing composition is that normally only one type can be produced on one machine. In bibliographic work there is great need for two or more typefaces, to distinguish titles of books and names of periodicals from the rest of the entry. The printer, of course, can use italics or bold face: italics for words which are less important, bold face for emphasis. On a typewriter, underlining gives the effect of bold face. In the library world we have a peculiar habit of underlining and thus emphasising unimportant words—*and, in* and so on, to say nothing of meaningless words like *comp.* I imagine that this practice arose from preparing copy for printed catalogues, where the underlining would indicate to the printer the words to go in italics. But even if the right words are underlined, underlining clutters up the appearance of a page and loses its effectiveness from over-use.

It is worth while giving some attention to special typewriters and other means of introducing type variety. The best-known device for this purpose is the Varityper, 'the machine with a thousand faces'. I must emphasize that this is a composing machine with a typewriter-like keyboard, and not a typewriter; it is of very little use for ordinary typing purposes. Complete sets of type can be changed in a few seconds; it takes a little longer if the type size is to be changed. A clockwork motor, wound by electric power, fires a hammer which hits the paper from behind against the ribbon, and the ribbon against the type. Otherwise the operation, including the rotation of a semicircular segment of type to select the right letter, is mechanical, and therefore considerably slower and more cumbersome than a typewriter. Some models have proportional spacing, and line justification is possible. The Varityper is an expensive machine compared with a typewriter, and expensive to operate because of its slowness, but there is no doubt of its value for large-scale production. It is finding a new market in the preparation of local newspapers for offset.

Another machine with simple type changes is the IBM 72, the electric typewriter which has a typehead like a golf ball that moves across the page carrying its own ribbon, the page staying stationary for each line. This machine is capable of typing at fantastic speeds. As yet there are only a few typefaces available, and no proportional spacing or justifying have been developed. In some quite ordinary typewriters the entire typebasket can be changed, but this is a mechanical job which is not economic for the occasional odd group of words in a different type. There are also clip-on typeheads, but their use is limited to extra characters occasionally needed—Greek letters and mathematical symbols, for instance. Another way is to use a number of typewriters, each with a different typeface. Because of the trouble of positioning the paper in each machine this is not of much use for repeated small changes of type, such as picking out the titles in a bibliography; but there is a great advantage in having whole sections of a publication in different typefaces, to break the monotony of the appearance. Additional types for occasional use can be had quite cheaply, in portable machines. If they are very different, however, there might be reproduction difficulties where they are on the same page; different types sometimes require different exposures on photocopying apparatus.

If only two typefaces are wanted, it is possible to buy two machines in tandem, either with a single enormous carriage or with a carriage unit that can be lifted, manually or electrically, from one typewriter to the other. This means simple positioning for small changes, but the typefaces chosen must be of the same pitch. A double typewriter is much more expensive than two ordinary typewriters. Perhaps the most satisfactory solution to this problem is the fitting recently introduced by Logabax Ltd for the IBM Executive typewriter. This device enables one to move the carriage of the typewriter slightly out of position, so that a retyping produces a bold face. On the same typewriter, and possibly on others, type boldening can be done in limited quantities by introducing some material to thicken the ribbon. I find leader tape for magnetic recording works quite well.

For the library which can afford it, a machine called the Optype will also provide type variations. The main purpose of the Optype is the justification of right-hand margins. A draft is typed with the lines at various lengths. The draft is then put into the machine and viewed through an eyepiece, a line at a time. Turning a knob squashes or stretches the appearance of a line to the required length, and it is photographed on to film for use with a pre-sensitized offset master. This is done with a series of distorting lenses, but the distortions of individual letters are not discernible to the naked eye. At the same time the Optype will reduce the size of the type if necessary; and it will by further distortion italicize it, condense it or bolden it. The whole process takes four or five minutes a page.

This raises the question of justification—making the right-hand margin vertically straight—which to many people is the principal obstacle to be overcome in making typing look like print. If you look through the many American publications that use typing and offset, you will find very few of them with justified margins. The reason is not hard to find: the cost. Justification *always* requires a second operation; except with the Optype, it requires a retyping; and other than with the Justowriter (a costly set of two punched-tape typewriters) the labour cost is doubled. In bibliographical work, where short entries are separated by a line of two of space, the effect of justification is not apparent enough to make it worth while. Where, however, there is an unbroken paragraph of text, close set, of a dozen lines or so, justification brings a marked improvement to the appearance.

With other kinds of machine, justification is a matter of working out the space required to fill a line to an appropriate length and adding this space in small doses throughout the line when retyping. With the general run of typewriters this means putting two spaces between words instead of one, and the effect is to leave obvious holes in the line. It is not generally realized that many modern typewriters, particularly portable ones, have a means of adding or subtracting half spaces, a feature well worth looking for when buying a machine. With these typewriters a gap of one and a half spaces is not noticeably bigger (than a single space) than is a gap of two spaces; and a line can be reduced in size by substituting half spaces for full spaces. This facility is sometimes known as a correcting space bar; it was originally devised to allow a five-letter word to be typed in a space where a four-letter word has been rubbed out. You will not normally find this feature on electric typewriters, but most proportional-spacing electric typewriters allow justification of a similar but more subtle style. Smaller fractions of a space can be added or subtracted. But even with these, some judgment on the typist's part is necessary. There are optical illusions to consider. An increase of space, however slight, before the letter a is far more obvious than the same increase of space before the letter b. There is an American device called the Marginator, an attachment to a typewriter, which automatically spreads the spaces on a second typing; and a similar device is incorporated in Varitypers.

A lot more could be said about typing for reproduction, but there is one other important matter which I must briefly touch on. The clarity of an image from typing depends to a large extent on the ribbon used in the typewriter. I have already mentioned the special ribbons for direct masters. For direct offset masters and for all kinds of indirect masters a carbon ribbon on a paper or plastic base is infinitely preferable to a cloth ribbon. As it is used once only, the copy remains evenly black. Or at any rate, it is as even as the typist's touch—and this is one reason why an electric typewriter is much to be preferred to a standard model; no matter how hard the keys are hit, the impression remains the same. Further, as the carbon ribbon is on thinner material the ink does not spread at the edge of the letters, and so the letters are crisper (unless some wrong exposure on a photocopying machine thickens them). Most electric machines can be bought fitted to take carbon ribbons. Some carry two ribbons, with the facility to switch from one to another; but the present tendency is to supply the machines with a carbon ribbon only, because nowadays the carbon is practically smudge-proof and the ribbons can be used for ordinary correspondence. Not all non-electric typewriters are capable of handling paper ribbons. On some machines the ribbon transport is liable to tear or snap them; and on some the ribbon moves forward only part of a space with each blow of a typehead, which means that one is typing on a ribbon from which part of the carbon has been removed. As the carbon ribbon is used only once, an ordinary spool of it is quickly used up; to avoid frequent spool changes an additional giant-sized spool holder can be fitted (this is a standard fitment with some machines). Ribbons of cellulose acetate, mylar or polyethylene are thinner than paper ribbons and therefore made longer.

So far I have been talking about 'typesetting' the text of a publication. When we come to the headings—which are very important in leading the reader not only to the parts of the publication which interest him, but also to those which do not—the typewriter is not very satisfactory; 12 point type, the maximum size on the ordinary typewriter, is not large enough to catch the attention. It can, of course, be enlarged photographically, especially by xerography. A carbon ribbon on an electric typewriter is a 'must' for this; enlarging from fabric ribbons produces jagged edges to the letters and coalescing of serifs. There are a few typewriters with larger faces, intended for typing labels, notices and other matter to be read from two feet to five feet away (one of them is sold mainly for typing sermons!). In general, such typewriters do not produce an impression even enough for photographing and reproduction.

For professional-looking headings there are several simple photocomposing devices, among them the Varityper Headliner, the Filmotype, the Fotorex and the Starlettograph. Each of these produces headings as a negative film, for splicing into a negative for offset, or alternatively as a positive photograph to be rephotographed with the rest of the copy. The letters are selected manually (in the more sophisticated devices, by rotating a wheel or spool) and exposures are made letter by letter. They are much too slow for setting body text, though small point sizes are available. Typeface changes are simple. Screens can be interposed to produce patterned letters.

Much cheaper and almost as quick to use are some of the letter sets now available. These are used without any special equipment. Letraset Instant Lettering—sheets of letters which can be transferred to a copy sheet by light rubbing—has rapidly become well known. The spacing of the letters is done visually; for those who find this difficult, Artype (Hunter Penrose Ltd) might be preferable. Artype has guide marks to help in the positioning; but it is more fiddlesome to set down. Fototype (J. J. Huber Ltd) consists of letters on strips of white cardboard which are set in a composing stick, strung together with adhesive tape and photographed. Fototype has an advantage over the others in that individual letters can be bought in bulk. The letters can be used again, if sliced apart with a razor blade. Finally I should mention the plastic letter-stencils used in drawing offices, and a pantographic device for changing shapes and sizes of hand-drawn letters, the Varigraph.

With these aids, banner headlines worthy of the most popular newspapers are easy. Usually 24 point type is large enough for headings combined with typing, but bigger and bolder lettering is useful for an eye-catching cover—the most important part of a publication from a sales psychology angle. If there is a tame artist on the library staff, he will gradually build up a technique for designing a cover with a particular duplicating machine in mind. To employ an outside artist, especially a professional one, will probably result in designs which give the duplicator operator no end of trouble. Lacking any artistic help, a lot can be done by using striking lettering, particularly in white on a dark background, and areas of solid colour. White lettering is available in several of the lettering aids I have mentioned. The same effect can be produced by using black lettering on a sheet of acetate foil (for instance, Letraset, or from other lettering by xerography) surrounded by black paper, which is then used as a negative in making an offset master.

Many librarians are sceptical about the use of bright or distinctive colours in something as dignified as a book list; I was myself, but have found that a large, solid area of colour on the cover of a library publication, or even inside, attracts its use, and this applies as much to a high-level bibliography as to a low-level recruitment pamphlet. It even helps to get it listed in national and subject bibliographies, with the result that one may sell enough copies to other libraries to pay for the cost of production! Colour duplicating with stencils is easy in some machines where the inking drum can be simply changed, and comes into its own with offset, for which a very large range of coloured inks is available. It does not cost much extra if the coloured parts of several publications are done at one change of ink. The capacity of duplicators to lay down solid areas of ink varies greatly; technical problems are simplified by breaking up the area in the design. One way of doing this is to use shading screens (Zip-a-Tone, Plastitone, Rasterfilm) which give a pattern of dots, hachuring, stripes, checks or herringbones, to mention a few of the decorative patterns available. Coloured ink on white paper is much more effective than coloured paper. The latter, incidentally, has another value: the tint increases the opacity of the paper, and so one can use thinner and cheaper paper for double-sided duplicating.

It remains for me to mention briefly some other bits and pieces of equipment necessary more for efficiency than effect. For layout and correcting errors a few basic tools are needed—transparent ruler and tweezers as a minimum. A drawing board, with drafting machine attachment for paralleling lines, is useful, or, even better, a light-box instead of a drawing board. In bulk production, two of the most valuable aids in reducing costs are the collating machine and the foot-operated stapler or stitcher.

These have been mundane matters; the really exciting part of library publications is conceiving and writing them. But it is no use writing them if they will look too dull for anyone to read or cost too much to be produced at all.

Letter to the Editor

'CHALLENGE AND OPPORTUNITY'

Dear Madam,

In the discussion following his stimulating paper 'Challenge and opportunity' (*Aslib Proceedings*, vol. 16, no. 3, 1964, p. 105–15), Mr Saunders is reported to have expressed the view that some really serious research on the long-term demand for graduate librarians was necessary.

Few would disagree with that view, but may I suggest that there is also a need for research into the *supply* of people with a good degree, a reading knowledge of two languages, a year's experience in a library and the ability to absorb in one year all that Mr Saunders quite rightly wishes them to know. Even if the requirement of a year's experience is dropped and the financial rewards increased, I suspect that the number of 'suitable' candidates (particularly science graduates) will be relatively small in relation to the required intake of librarians throughout the profession.

Mr Saunders implies that there is a need for expansion in the number of professionally qualified graduates. I wonder if there is another way of approaching the problem? I have for some time thought that librarianship itself should become an undergraduate study, and that the library schools should be attached to Universities (and possibly Colleges of Advanced Technology). Requirements for entrance would be as for other degree courses, e.g. two or more GCE Advanced Level Certificates. I am quite certain, from several years experience as a practising librarian, that there is a sufficiently wide field of study to occupy a three-year course, but for those who doubt this contention I would add that undergraduates would be expected to 'minor' in an academic subject, e.g. a foreign language, in addition. And as Mr Saunders remarks, at Sheffield there was never 'the slightest doubt expressed about the "academic respectability" of librarianship, or whether it was a proper subject of study for a university; and one cannot but wonder whether this ancient bogey may largely be one that we librarians have created for ourselves'.

It is, of course, possible that the Library Association, having succeeded in revising its examination syllabus in the face of considerable opposition, is thinking on the same lines as regards future development. The university library schools would want at least as much freedom as the present schools are trying to get, which would cut across acceptance of the LA as the only real examining body, but this is already being challenged by the Institute of Information Scientists. In any case other professional associations seem to have solved this difficulty.

I am well aware that mine is not an original proposal, but as far as I know the pros and cons have never been fully discussed. I hope they will be, because I cannot believe that the present two-tier system will provide the opportunities, status and rewards which should be available to the library profession as a whole.

Yours faithfully,
C. F. CAYLESS.

26 Plantation Road,
Tadley,
Basingstoke, Hants.
10*th April* 1964

SELECTIONS FROM THE RECENT LITERATURE

ALL ITEMS listed may be borrowed from the Aslib Library, except those marked *, which may be consulted in the Library.

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The charge for advertisements in these columns is *4d* per word, minimum *5s.* An additional charge of *6d* is made for the use of a box number.

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WILFRED E. GOODAY, ARSM, DIC, MIMM, FIL. Member of Translators' Guild. Rumanian and French. 161 Rivermead Court, London SW6. Renown 1912.

TRANSLATIONS FROM TURKISH. All subjects. F. P. Scott, 4 Uphill Grove, Mill Hill, London NW7.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. STAmford Hill 8564.

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LIBRARIAN required to control and develop the existing library of the *Architects' Journal* with the object of providing an up-to-date information service. Interest in building documentation is essential. Besides classification and cataloguing the duties include locating and borrowing materials from outside sources, compiling bibliographies and handling press cuttings. Applications should be addressed to The Editor, *Architects' Journal*, 9–13 Queen Anne's Gate, London SW1.

ASSISTANT LIBRARIAN. A vacancy has arisen for an Assistant Librarian with H. J. Heinz Co. Ltd, and applications are invited from men aged 18–40 educated to at least GCE 'O' level standard. Library Association qualifications either FPE or ALA (or part) will be preferred, although not essential, and candidates should have an interest in information work with a technical bias. Duties at present include book selection, loans from other libraries, information work and part editing of a bulletin but may be varied according to applicant appointed. The successful candidate will work initially at our Head Office in NW London but towards the end of this year will be expected to transfer to a new administrative headquarters in Hayes, Middlesex. Please write, giving brief details of personal history to date, to The Personnel Officer, H. J. Heinz Co. Ltd, Waxlow Road, Harlesden, London NW10.

ASSISTANT MANAGER, INFORMATION DEPARTMENT, is required by POWELL DUFFRYN LTD at its London (City) head office. Duties include collection and dissemination of commercial and industrial information, answering inquiries, preparation and editing of material for bulletins and reports, supervision of staff and a small library, and assisting in administering and developing the information service generally. Candidates should be men, aged 25–35, of good education, with some years' experience in information work, or in a similar commercial or industrial post. Applications with full details of previous history, stating salary scale required, and quoting Ref. PD 37B/64, should be addressed to The Group Personnel Officer, Powell Duffryn Ltd, 8 Great Tower Street, London EC3.

THE BRITISH STANDARDS INSTITUTION requires a TECHNICAL OFFICER for its Documentation Section. The work will be primarily concerned with the completion of the English edition of the UDC but also with committee work on British Standards and international recommendations for bibliographical references, abbreviations for periodical titles, transliteration and document reproduction. Applicants should possess a working knowledge of German or French. The starting salary will be dependent on age, qualifications and experience. The post is pensionable. Apply to the Establishment Officer, B.S.I., 2 Park Street, London W1, quoting reference (DOC) and giving a brief resumé of education, qualifications and experience.

ASSISTANT required in library to undertake the preparation and editing of abstracts. Permanent post, hours 9.15 a.m. to 5.15 p.m. Monday to Friday. Salary scale £600 to £780. Applications stating qualifications and experience to The Secretary, Timber Research and Development Association, St John's Road, Tyler's Green, High Wycombe, Bucks.

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K. I. PORTER

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Aslib Proc. vol.16 no.6 p.183-205 London, June 1964

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ASLIB PROCEEDINGS

incorporating Aslib Information

CALCUTTA

Volume 16 **June 1964** **Number 6**

ASLIB CALENDAR 1964

June

WED. 17 – FRI. 19. Course on photographic copying in the information department.

MON. 22 – FRI. 26. Repeat of senior introductory course to special library and information work.

September

MON. 28 – THUR. 1 October. 38th Annual Conference at University of Exeter.

October

THUR. 8. Technical Translation Group meeting at Aslib, 4 p.m. ‘Soviet information services’.

THUR. 15. Repeat of advanced course on patents—the new European patent system.

THUR. 22. Evening meeting at Aslib, 5 for 5.30 p.m. ‘What is classification?’, by J. R. Sharp.

November

FRI. 13. Technical Translation Group sherry party.

Midlands Branch

The Branch held a week-end conference at Hertford College, Oxford, from 17th to 19th April, on the theme 'Educating the user'. Mr Gordon H. Wright, County Technical Librarian of Hertfordshire, in a paper on 'Educating tomorrow's potential information user', discussed critical thinking and the art of communication. Mr J. E. Terry, Information Officer, AERE Harwell, described the course on information sources and library services which is run for scientific officers at AERE. Mrs Irene Veasey of Blackwell's urged that Aslib appoint advisory officers to discuss with representatives of organizations the practical aspects of information dissemination within their own concerns. Mr Jack Bird, Education Officer, Aslib, and the three speakers were on a panel to discuss points arising from the papers, and open discussion then followed.

Northern Branch

The Vice-Chairman of the Northern Branch for 1964–5 is Mr L. Taylor, Group Librarian, Ferranti Ltd. It will be Mr Taylor's third year of office as Vice-Chairman. The other Officers and the Committee of the Branch were announced in the April issue of *Aslib Proceedings*.

Textile Group

The Annual General Meeting of the Group was held at the National Lending Library for Science and Technology, Boston Spa, on 7th May. Twenty-three members attended. After the meeting members were taken round the library and a talk on 'Translations with particular reference to Russian and NLL resources' was given by Miss Bunn.

Research Development Production Exhibition

Aslib had a small stand at the Research Development Production Exhibition which was held at Olympia from 4th to 9th May. The exhibition was sponsored by the *Times Review of Industry and Technology* and was opened by HRH the Duke of Edinburgh. The Aslib stand attracted considerable interest and a number of inquiries about Aslib were received from people in industry having a definite interest in research for production.

Feature Card Indexing Conference Reviewed

The Aslib conference 'A new look at feature card indexing', which was attended by 220 members of Aslib on 8th April, has received publicity in an article in the *Office Magazine* for June 1964 (p. 446–8). The article, which is illustrated, contains a brief evaluation of the conference and reproduces the text of the opening paper, 'Satisfaction at Lloyd's', by Mr G. M. Boyd, O.B.E. Copies of the *Office Magazine* may be ordered from Current Affairs Ltd, P.O. Box 109, Davis House, 69–77 High Street, Croydon, Surrey, price 2*s* 6*d*.

Journal of Documentation Reprinted

Back volumes of the *Journal of Documentation* have been out of print for some time, and to meet the steady demand for these Aslib has entered into a contract jointly with the Johnson Reprint Company and the Kraus Reprint Corporation for the reprinting, by offset litho, of vols. 1–15, 1945/6–59. These are now available and orders are being taken by the reprint companies concerned. Prices are as follows:

cloth bound set	£53 15s	($150.00)
paper bound set	£48 7s	($135.00)
single volumes, paper bound	£3 5s	($9.00)

Postage and packing will be extra.

All orders should be placed direct with Johnson Reprint Company Ltd, Berkeley Square House, London W1; or Johnson Reprint Corporation, 111 Fifth Avenue, New York 3; or Kraus Reprint Corporation, 16 East 46th Street, New York 17. **Orders should not be placed with Aslib.**

Retirement of Miss Dorothy Myles

Miss Dorothy Myles retired in April after thirty-five years' service with The International Nickel Company (Mond) Limited. When, in 1929, she joined the Research and Development Department there the concept of an organized 'special' information service was relatively new but there existed a few small groups of enthusiasts who were fast proving its value in industry. One of these groups was in The Mond Nickel Company, where documentation on metallurgy and related subjects was being built up to support the technical activities of the company and its associates.

Throughout her career Miss Myles has shown outstanding ability in such work. In 1956 she was appointed Technical Information Officer of the company and led her department during a period of rapid expansion. Miss Myles has done much to further the cause for which Aslib stands, and her friends in the membership will want to wish her happiness.

Engineering Information Retrieval

A course of lectures on engineering information retrieval is being sponsored by the Institution of Chemical Engineers and will be given by Mr B. E. Holm of E. I. Du Pont de Nemours & Company. The lectures will be designed for research directors, engineers and information officers in the engineering world, and will be held at Imperial College, London, from Monday 29th June to Thursday 2nd July. Further information may be requested from The Institution of Chemical Engineers, 16 Belgrave Square, London SW1 (telephone Belgravia 3647).

What's available in the Technical Library

This is the title of a recent pamphlet published by Manchester Public Libraries. The author is Mr F. R. Taylor, F.L.A., Librarian, Manchester Technical Library. Mr Taylor describes the coverage of the library and gives detailed accounts of its resources; for example, periodical location guides, sets of standard specifications for this country and overseas, and classes of atomic energy documents (for which the library is a depository). The special services offered, such as the Technical Information Service and the Patents and Microtexts Library, are fully described, and there is a bibliography of guides to the literature of science and technology. *What's available in the technical library* may be obtained from the Technical Librarian, Central Library, St Peter's Square, Manchester 2, price *2s 6d* post free.

Association of Student Librarians

An association has been formed to promote liaison and professional activities amongst students of librarianship throughout the country. It will be called the Association of Student Librarians and a constitution is being drawn up. Eight Schools of Librarianship are at present represented in the membership. Further details may be obtained from the Acting Secretary, Association of Student Librarians, School of Librarianship, North-Western Polytechnic, Prince of Wales Road, London NW5.

Research Station Open Days

The DSIR Building Research Station has announced that it will be holding open days from 22nd to 25th September. Details may be requested from the Director of Building Research, Building Research Station, Garston, Watford, Hertfordshire.

Library Furniture and Equipment

Members will recall the publication last year of this reference guide to library equipment. A second edition is now in preparation and its new compiler, Mrs Patricia Millard, would be interested to hear from librarians and information officers who have recently had to equip or refurnish their departments, as to the merits and demerits of the products chosen or rejected. The scope of the book will be greatly increased to include sections on tape recorders, photochargers, inter-com telephones and so on, but inclusion will be on a selective basis. Critical comments on design and performance will be given and also information about prices. Mrs Millard has invited comments on all types of library equipment from card index drawers and transfer cases to lighting equipment and chairs; she would also be interested to see photographs of libraries and specialist departments where new equipment has recently been introduced, especially if these photographs could be compared with ones of the same library before alteration. All assistance will, of course, be gratefully acknowledged. Members may get in touch with Mrs Millard at 77 Blandford Street, London W1 (telephone Welbeck 7503).

New British Standards

Recommendations for the preparation of indexes (BS 3700) is the title of a new standard published by the British Standards Institution, with the active support of the Society of Indexers. Its aim is to encourage more uniform practice among indexers. It includes definitions of an index and its components, recommendations on the content, construction and presentation of indexes and an outline of basic principles and practice. The standard has its own eleven-page index, compiled by the Chairman of the Society of Indexers.

The BSI has also published a standard on *Blue-black inks for fountain pens* (BS 3721), which is the third of a series of standards for ink of various types. Work is in hand on projects for red inks and ball-point pen inks, among others.

Both publications may be obtained from the BSI Sales Branch, 2 Park Street, London W1. BS 3700 costs 10*s* a copy and BS 3721 costs 4*s* 6*d*. (Postage will be charged extra to non-subscribers.)

Information Science Course

The Department of Scientific and Industrial Research has accepted the information science course at Northampton College of Advanced Technology, London, as suitable for the tenure of its Advanced Course Studentships. Two places have been offered in the first instance.

New Directory

The *Directory of British Associations*, compiled by C.B.D. Research Ltd, is almost ready and will be published in the autumn. The directory lists associations, societies, unions, and other similar bodies that are nationally significant. All fields are covered and there is a field index. Information given includes address, regular publications, number of members, and classes of membership. There is an index of abbreviations. Orders for the directory should be addressed to C.B.D. Research Ltd, 57 Blandford Street, London W1. The pre-publication price is 40*s* a copy.

NEW MEMBERS

CORPORATE

Name	*Locality*	*Representative*
Auerbach Corporation	USA	Mrs S. D. Nester
Bridge, David, & Co. Ltd	Lancashire	H. A. Wainwright
British Road Federation	London	M. Francis
British Technology Index	London	E. J. Coates
Cathodeon Electronic Ltd	Essex	W. A. Hewson
Delft. Technische Hogeschool	Holland	B. J. C. Jense
Direccao Provincial dos Servicos de Geologia e Minas	Angola	The Director
Emerson Consultants Ltd, The	London	W. W. Allen
Esso Petroleum Co. Ltd (Technical Sales Department)	Middlesex	J. F. Anderson
European Launcher Development Organization	France	Miss E. J. Lindsay
Focal Press Ltd	London	A. Kraszna-Krausz
Gallwey Group of Companies, The	Buckinghamshire	C. T. Kyte
Gibson, Robert, & Sons Ltd	Lanarkshire	C. H. Brown
International Planned Parenthood Federation	London	Miss P. Gordon
International Synthetic Rubber Co. Ltd, The	Hampshire	C. F. Luft
Inveresk Paper Co. Ltd	London	G. D. Butterworth
Irish Refining Co. Ltd	Ireland	D. P. Walls
Johnson's Wax International	Surrey	J. W. Vernon
Kirkby Fields Training College	Lancashire	The Principal
Laboratorios Ferrer S.L.	Spain	C. Ferrer
Linnean Society of London	London	Miss S. J. Raphael
Macpherson, Donald, & Co. Ltd	Lancashire	S. L. Mole
National College of Agricultural Engineering	Bedfordshire	B. A. Morgan
Naylor, Benzon & Co. Ltd	London	W. F. M. Ashby
Peterborough Technical College	Northamptonshire	B. P. Engler
Queen Victoria Hospital	Sussex	Dr D. A. L. Davies
Research Designs & Standards Organization	India	Director General
Scragg, Ernest, & Sons Ltd	Cheshire	A. J. Bayman
Small & Parkes Ltd	Lancashire	A. Jenkins
Sternol Ltd	London	R. L. Gaskin
Therapharm Ltd	Surrey	P. R. Bishop

INDIVIDUAL

Name	*Locality*
Aitchison, T. M.	Bedfordshire
Bakewell, K. G. B.	Lancashire
Cracknell, Miss R.	Norfolk
Fisher, Miss M. E.	Warwickshire
Fullman, B. (Hon. Member)	London
Hooper, Miss J. G. T.	Canada
Mayne, A. J.	Sussex
Middleton, Miss S. J. M.	Buckinghamshire
Rafter, Mrs S. G.	USA
Strathern, Mrs G. M.	London
Thomson, Miss E. A. M.	Surrey

THE NEW BUCOP

The Problems of the Documentation of Serial Publications

K. I. PORTER, M.A.
Editor, BUCOP

Chairman, Dr C.B.Oldman, C.B., C.V.O., F.S.A., formerly Principal Keeper, Department of Printed Books, British Museum

Evening meeting, London, 25th March 1964

INTRODUCTION

THE National Central Library took over the responsibility for continuing the publication of BUCOP at the beginning of 1962, and the work of compilation was added to the normal routines of the Periodicals Union Catalogue. Coupled with the decision of the council of the *World list of scientific periodicals* to merge with BUCOP after the publication of its fourth edition, this has had the effect of reducing from three to one the number of reporting centres for libraries disposed to co-operate in national union schemes embracing serials. In consequence, the NCL's serial catalogue, which is in the process of revision so as to conform as a whole to the new BUCOP principles of entry and arrangement, has to serve two purposes: as a working tool in handling serial applications received in connection with the interlibrary loan system, and as the source from which BUCOP's 'copy' is made up. Since the NCL's own collection of serials is small at present, we are to a large extent dependent on the goodwill of the co-operating libraries not only for information on the extent of their holdings of a particular title but also for details concerning the title itself. Naturally we have access to the large serial collections held by libraries in the vicinity of the NCL, although staff time available constitutes a limiting factor in this respect, and we are exploring ways of increasing the supply of information on new serial titles from the publishers; however, the manner in which libraries notify us of their holdings, and the form of entry they use, must inevitably remain important factors governing the work of compilation, underlining the need for a greater degree of standardization of practice in recording serial publications.

Before proceeding to the description of the new publication I should perhaps mention that the opinions expressed on matters over and above those concerned with BUCOP itself are my own and do not necessarily coincide with the official view of the NCL at all points. I shall begin by discussing the terms used in the subtitle to this paper, 'the problems of the documentation of serial publications', insofar as they pertain to union lists in general and to BUCOP in particular. I am using the word 'serial' as a more comprehensive term than 'periodical' although it is the latter which actually appears in the title and subtitle of the work under discussion. To me 'periodical' implies a serial which appears at more or less regular periods, more frequently than once a year, but let us assume for the present that the two terms are synonymous. Certainly the definitions of the two words given by the Anglo-American code sound very similar. And what is a 'serial'? Dr Johnson might have said, 'Sir, we know what a serial is and there's an end on it'. All the same, I should like to essay a personal definition as follows: 'A succession of related and normally uniform publications with a collective title and continuous numbering not intended as the successive parts of a single publication'. It will be noted that this has certain similarities to the AA definition of 'series'; the AA definition of a 'serial', on the other hand, begins, 'a publication issued in successive parts', which strikes me as describing one of the things that a serial is not, while the phrase from the same definition 'as a rule intended to be continued indefinitely' might be thought to exclude, for example, research reports emanating from the work of a completed expedition or issued in connection with some such project as the International Geophysical Year, to which there must presumably be an end although such publications behave like serials during their lifetimes.

Be that as it may, the Introduction to the new BUCOP specifies certain categories of publication which are officially excluded; like all categories, however, they have blurred edges, and in case of doubt I would say that an item would be more likely to be included than not. These are the 'excluded' categories: the routine, administrative reports of a body, giving a bare account of activities and perhaps including a balance sheet, although research reports are included; conference proceedings, unless they constitute the matter of an editorially independent serial; works revised at progressive intervals to be kept up to date, unless the additional material is of interest in its own right, as in the case of statistical yearbooks; newspapers; and serial publications of ephemeral or of narrowly local interest. Since the interpretation of the last category is likely to be more subjective than the others, I should say that the existence of a single holding—outside the holdings of the British Museum—in its own immediate area of publication might justify exclusion under this head. Numbered monographic series, and 'service' publications which are progressively cumulated or supplemented, are included but with a warning that the holdings shown may not be completely representative of the co-operating libraries as a whole, because of variable practice in the cataloguing of such material.

It might be thought that the word 'documentation' is more applicable to the contents of serials, the field of subject indexes, abstracts, and the like, when what I mean in this context is simply 'recording'. However, apart from the fact that a list of titles, giving information on their availability, is obviously a necessary adjunct to indexes and abstracts, the new features, both actual and potential, which are being built into BUCOP might be thought to justify the more ambitious word. All the same, the intention of the new BUCOP is substantially the same as that of its predecessors; to list serial titles, with a necessary minimum of bibliographic information, together with an indication of the libraries holding that title, and the extent of their holdings.

BUCOP

The period covered by the original four-volume set of BUCOP with its supplement was from the beginnings to 1960, while the fourth edition of the *World list of scientific periodicals* deals with the period 1900–60. The new publication is taking 1960 as its departure point, although the first issues reflect our intention to list the most recent information available that could usefully be published. Thus the initial issue will contain titles pertaining to the years 1963 and 1962. The subtitle of the work, 'New periodical titles', signifies that new publications will be listed together with new entries for changed titles. To make a complete record of changes in the status of existing serials we shall also list titles which are known to have ceased publication without a successor. Four issues of BUCOP will be published during each year, all of which will be superseded by an amended annual cumulation. A separate annual volume will be published which cumulates the scientific and technical serials that have appeared in the previous four issues, in effect continuing the *World list*. The annual issues will themselves be eventually cumulated, probably into quinquennial volumes. The 'backlog' of titles for the years 1960 and 1961 will be published, either as a separate volume or as part of the first 'cumulation of cumulations'. Each issue, and the cumulations, will be divided into two principal sections: a main entry sequence of titles, followed by an Appendix of bodies responsible for the publications in the foregoing section, with the titles issued by each of them.

The new features introduced into BUCOP, namely the Appendix, the future cumulations, and the availability of separate volumes, as well as the possibility of further future divisions of the work, have been made possible by the use of IBM punched cards. The NCL has installed an 026 card puncher, on which the decklets of cards required for each entry are produced, to be processed through a 1401 computer. The resulting print-out forms the basis of the actual publication. The 80-column cards have been programmed into six fields, whose function I shall describe to you.

The first field (card columns 1 to 8) contains the 'Title code', which places the entry into its correct place in the main title sequence and in the subsequent cumulations. It consists of the initial letter of the first significant word of the title followed by a six-place numeral. As you can imagine, care must be taken in selecting this numeral so as to permit the insertion of other entries around it as they are required in subsequent issues. The numeral itself is not printed with the entry.

The second field (card columns 9 to 16) contains the 'Body code', where required by the existence of a sponsoring body for a particular title. This code consists of the first two letters of the body's name followed by a five-place numeral. The computer uses this code to place the entry in the Appendix, with the name of the body as the heading, followed by the title concerned.

The third field (card columns 17 to 22) has been allocated to provide for the present and potential divisions of the work into subject sections. At the moment column 17 is used almost exclusively in this field. This column is punched with a '1' to categorize a serial concerned with general topics, or with the humanities, or the social sciences. A '2' is punched to represent scientific and technical titles. A '3' is used for those subjects which would be of interest to the two 'cultures', such as geography or psychology. At the cumulation stages the entries punched '2' and '3' in this column will be out-sorted to produce the scientific and technical volume of the work. As you can see, this coding would also permit the production of a separate section for the humanities and social sciences, if there were a demand for it, by out-sorting the '1' and '3' cards. All cards are printed, of course, for the comprehensive cumulation. Column 18 has been set aside for any special subject interest which forms a coherent group. At the moment a '1' is being punched into this column for medical serials. The remaining columns are being held in reserve against future requirements. They might be used to categorize particular publication areas, or topic areas, or language groups. Naturally any expansion of the coding of this field would entail extra editorial work and is not under practical consideration at present.

The fourth field (card columns 23 to 25) contains the last two digits of the year of publication. There is no specific use for this field at present but it may be useful at a later stage in controlling period divisions of the cumulated entries. The fifth field (card columns 26 to 32), on the other hand, performs a variety of important functions. Column 26 contains the card type code, which I shall explain in a moment, and column 32 contains the sequence number governing the order of the cards for each type, if more than one is required, up to the number of nine. Column 26 is coded to control the shape of the actual entry as it appears in BUCOP, and is numbered according to the following pattern: '1' is used for the title; '2', '3' and '4' are all used for the publishing body, with the provision that '2' cards are printed both in the main entry and in the Appendix; '3' cards in the Appendix only, and '4' cards in the main entry only. '3s' are used, for example, when the name of a body appears in the title and it would be superfluous to repeat it in the entry; '4s' are used, for example, for the name of a commercial publisher, which is not used as a heading in the Appendix. '5' cards produce the imprint, place, issue number and date, while '6' cards are for any remarks that need to be appended to an entry. Cards '7', '8', '9' and '0' explain the use of columns 27 to 31 in this field, as these are concerned with holding libraries. The library symbol, which will in future consist in every case of three letters followed by a numeral of up to two places, is fitted into these columns. Cards '7', '8' and '9' are for holdings printed as part of the main entry: '7' for complete holdings (disregarding the circumstance of odd issues missing), '8' for continuous runs from an intermediate point in the serial's life, and '9' for closed, partial or temporary holdings. Provision has been made for suppressing the '8' and '9' categories if there is a considerable number of holding libraries represented by the '7' cards, and '9s' are in fact printed only if there are comparatively few holdings represented by the '7' and '8' cards together. '0' cards have been used to produce the Index of Library Symbols accompanying the new BUCOP. This category may eventually be abandoned when this index reaches a point of stability which could justify its being set in letterpress.

The sixth and final field (card columns 33 to 80) contains the text as it actually appears in the publication. This text will have an unfamiliar appearance to those who are not acquainted with computer-produced records and as compared with the predecessors of this publication. The entry is entirely in upper case, without serifs; there is no variation in the density of the type and there are no diacritics. The range of punctuation is somewhat reduced. However, I do not believe that this will at all impair legibility, perhaps even the reverse.

Next I should like to proceed to a closer examination of the BUCOP symbol and its implications.

Librarians know only too well that virtually every British union list of holdings in various publication fields uses a different set of library symbols. Consequently, I feel I should apologize for the fact that the new BUCOP will introduce yet a further set, and attempt to satisfy you that the reasons for this have some merit. In the first place it was desirable that all symbols should conform to the same general pattern, thus providing a constant code in the appropriate field of the punched cards to facilitate interpretation by the computer. At the same time it was felt that some of the principles implied by the former BUCOP symbols should be retained. As a result the pattern chosen for the new publication is a three-letter code followed by a numeral, allowing for two places. The first two letters are to locate the library, the third to give a general indication of its type, and the numbers to distinguish libraries of the same type in the same place. Other approaches might have been used; for instance, the library could have been represented by the initial letters of the first three significant words in its name, numbered in case of duplication, but the example both of the previous BUCOP and of the *World list* seemed to suggest that an indication of the location of the library would be useful. I should perhaps mention that one of the reasons for restricting the number of letters to three is that it requires more computer time to read a letter code than it does to read a number code, and consequently the more letters there are in any code the more expensive is the computer process.

To come to the details of the symbol itself; the place indicated by the first two letters of the symbol may be specific or general. The range of towns represented has been reduced from the coverage of the former BUCOP and is restricted to the larger centres and to university towns. Extensions can be made to this scheme if justified, for example, by an agglomeration of co-operating libraries in a particular town which was not otherwise assigned a specific symbol. Otherwise symbols have been allotted for areas corresponding with the regions covered by the various regional library bureaux in England, with another set to represent Scotland, Wales, Northern Ireland, and Eire. The mnemonic principle is followed in assigning symbols to towns; the regions of England are represented by an 'X' followed by a suitable letter to suggest the particular area, while a 'Z' followed by an appropriate letter is used for the remaining units of the British Isles.

The types of library indicated by the symbol, also represented as far as possible mnemonically, are as follows: 'N' for national libraries and major government departments; 'P' for public libraries; 'U' for university libraries; 'C' for colleges of science and technology and other educational institutions other than those of university status; 'S' for special libraries in general, learned societies, and professional associations; 'R' for the libraries of institutions engaged in scientific research; 'T' for trade associations and institutions concerned with the technical applications of science; and 'F' for commercial firms. An extra category, which overlaps certain of the above, is 'M' for medical libraries of all kinds, which are presumed to be a more or less cohesive group in themselves.

Thus the library symbol, as you can see, is intended to provide certain information concerning the library it represents. In addition it contains certain potentialities for processing through the computer which may be of use in the future. For example, the library resources of a particular town or area could be out-sorted from the punched card sets pertaining to the publication as a whole and printed separately; or the nation-wide holdings of a particular category of library could be so listed, or the holdings of a particular category of library in a particular place, if such extractions were specifically required or commissioned.

What should be the relation of BUCOP to other union schemes which may exist in the United Kingdom? It has already been pointed out that on a national scale the situation is now more unified than it was before. But there remain a number of schemes in existence covering a particular area, or a particular subject interest, or type of library. In view of the potentialities of the new BUCOP as I have outlined them, what should their future policy be *vis-à-vis* BUCOP, and what should BUCOP's policy be? Assuming that a certain union system is a going concern and is not looking for an opportunity to wind itself up, obviously it would be more efficient from all points of view if it were to direct its activities to supplementing BUCOP rather than to pursue a completely independent course. This view might be modified where the co-operating group was principally engaged in interlending among its members as a more or less closed system, and it would be a matter for individual libraries in such a group to decide whether they should also deal direct with BUCOP. In general, however, I would say that local schemes might perform a valuable service if they were to act, as it were, as a local agent of BUCOP, assembling and forwarding information on libraries in their area, to be accredited as holdings of a specific library, or those of a collective unit which maintains and, if desired, publishes the details of the actual locations. It would probably be preferable if libraries already co-operating with BUCOP direct were excluded from more limited schemes, but in such cases duplication is undoubtedly better than no notification at all. In principle I should like to think that BUCOP will eventually be notified, either directly or by proxy, of all useful and documented serial collections in the British Isles so long as they are at all available to public inspection, either in their original form or in photographic copies.

Another kind of union list, where BUCOP and the individual compiler might be able to work together to mutual advantage, is the special subject list. The compiler of such a list might first consider whether it might not be more useful to append annotations rather than holdings to the titles he has assembled, on the assumption that a central 'bank', as it were, representing the comprehensive holdings of the widest available range of British libraries, was generally known to exist in the NCL. On the other hand, if the compiler felt that his list would be most useful if it were accompanied by holdings, he should feel free to avail himself of the information contained in the NCL's catalogues and supplement it at need by himself negotiating with those libraries, relevant to his purpose, which may not be co-operating with BUCOP. Since union lists begin to go out of date as soon as—and sometimes before—they are published, my personal feeling is that annotations would be more useful in a special subject list than holdings, if it came to a choice, as long as information on holdings was available elsewhere.

Whatever the machinery by which libraries co-operate in the production of union lists, much could be done to advance national co-operation in spirit if not in detail if all systems were to agree on the standardization of their methods, and this brings me to the matter of the entry of serial publications.

The problems incurred in recording serials, on the one hand, and in tracing them, on the other, are familiar enough; their resolution, or at least their rationalization, depends on two approaches. The first of these would be through standardization of practice, which concerns all libraries or recording centres that do not regard themselves as completely independent of the resources of others. The Statement of Principles emanating from the International Conference on Cataloguing Principles, held in Paris in 1961, is aimed at inducing some degree of standardization on an international scale; unfortunately, it does not treat serials as a distinct class and has comparatively little to say about them, and in its recommendations on the subject of 'corporate author' serials is not unambiguous. It states clearly enough, however, that in general serials must be identified by their titles, making separate entries for successive titles in the case of a change. BUCOP's practice reflects this in always making its main entry under the published title. This is also the case with regard to serials whose titles include, either directly or by implication, the name of a corporate body; that is to say, in this matter BUCOP is now following the practice of the *World list*. Numerous cross-references are made, as required, and it is intended to introduce, at one of the cumulation stages, a 'permuted', or KWIC (keyword in context), index, as an additional aid in locating partially known titles. The Appendix of sponsoring bodies should ensure that an individual body's publications can easily be located, even if the precise form of title is not known.

The details of BUCOP's methods in handling 'problem' titles are outlined in the Introduction, and I can only hope that these might commend themselves generally as a basis for standardization in recording serial publications. Where there is most likely to be a serious difference of opinion is, as far as I can see, in the treatment of 'corporate author' serials. Libraries which prefer to make their main entry in such cases under the name of the body could just as well continue to do so, with no serious inconvenience caused to BUCOP in recording them, provided their entries are so organized that the actual title can readily be inferred or reconstructed. This is particularly important where subordinate bodies are involved; where the name of a body begins a title, either in full or as initials; or where the name of the body in the title differs from the form in which it would normally be used as a heading. Of course standardization in the matter of making such a heading is also an important consideration, but here the Statement of Principles previously referred to is rather fuller. BUCOP follows these recommendations (explaining the details of its handling of them in the Introduction) in making headings for the Appendix, which is also the form in which the body's name appears in the entry with which it is associated.

The second approach to the solution of problems of serial entry which I had in mind concerns the source of these problems—publishers. There is a British Standard (2509 : 1959), conforming to the main recommendations of an International Standard (ISO/R 8, Layout of periodicals) in this connection, entitled 'Periodicals of reference value; form and presentation'. This standard offers excellent advice but it seems to me that it could well be expanded and publicized at frequent intervals in places where publishers might be inclined to take notice of it. I should like to rehearse to you some of the ways in which publishers could simplify the work of the serial cataloguer, not all of them covered by the standard cited. Surely they can be persuaded that it is in their own interest to label their publications clearly enough to facilitate their recording and consequently their retrieval?

Primarily a serial ought to have a clear-cut and self-explanatory title. Great care should be taken in selecting it, so that there should be no urgent need to change it, at least for a few years. The title should be printed clearly on the title page or its equivalent, without typographical variations that might suggest that a particular phrase is not an essential part of the title but merely an embellishment. On no account should a cover title or running title differ from the one on the title page—except, perhaps, for an adequate and recognizable abbreviation. Scholarly serials should avoid 'cute' titles especially if they include a more informative subtitle. The use of initials in, or as, a title should be carefully pondered. Multiplicity of titles should be avoided, unless there is good reason for them, as in the case of multilingual serials. Preferably, a serial should have a single title; or if it is felt to be necessary to include a more general series title, or a subseries title, one should be given clear priority over the others, typographically and by numbering. I have encountered serials with as many as three collective titles, numbered in each of them. It is inadvisable to include a word denoting frequency in a title, if it is adequate without it, both because it could be embarrassing if the publication programme had to be altered and because, if it appears to be superfluous, it might be dropped by cataloguers or overlooked by catalogue users.

What of the publications, official or quasi-official, of corporate bodies? Should the body's name form part of the title or not? How should it appear in the title? I realize that it would be very difficult to establish a standard of practice in this connection, but a few points might be worth consideration. First, if the serial comprises papers submitted by members, for which the body is not disposed to accept collective responsibility—would this be a case of 'corporate editorship'?—it might be advisable to omit the body's name from the title. The topic phrase from the body's name could serve as an alternative, however, or such a phrase preceded by 'Journal of . . .' or 'Australian journal of . . .' as appropriate. Assuming, however, that the name of the body is to be included in the title, should the 'genius of the language' decide the way it is to appear? Oriental languages, and European languages of an oriental bent, appear to employ a word order which would find favour with those who prefer corporate entry; for example, *Ankara Universitesi Tip Fakultesi Mecmuasi*, which can be literally translated as 'Ankara University Medicine Faculty Proceedings'. European languages in general, on the other hand, normally use the opposite approach, whether prepositions or inflections are employed. This might seem to be the usual case where the English language is concerned, although titles which begin with the name of the body, either in full or as initials, are frequently encountered. This latter situation is much less frequent where subordinate bodies are involved.

These matters, as I say, probably are not susceptible to standardization, and all I would add is that lists and catalogues should make clear what is, in fact, the precise form of title, however it is entered. There are two practices where corporate bodies are concerned, however, which I think should certainly be avoided. One is the matter of the 'scattered' title where the word or phrase denoting the type of publication is separated on the title page from the name of the sponsoring body. BUCOP generally follows the *World list* practice in handling this problem, with the modification that where subordinate bodies are involved in such a case the name of the lesser body precedes the greater in the title as given, as being more analogous to the usage in similar titles which employ prepositions. Related to this problem is a situation where a serial is issued without a title at all; the publication is presumably to be identified by the name of the sponsoring body, together with a code composed of letters or numbers or both, which may even sometimes imply the type of publication it is intended to represent. This is a case where the name of a body as a title can appear in the main section of BUCOP but there is still an added entry in the Appendix for such material.

Apart from the title it is the numbering which ensures the correct identification of a particular issue of a serial. The British standard referred to recommends that 'volume and issue numbering should be used for all periodicals', and that a volume should be equivalent to a calendar year. It is a pity that there is no English equivalent for words like Année, or Jahrgang, as this is usually what is meant by 'volume' as far as serial publications are concerned. Irregular serials, however, and monographic series are frequently identified by a simple running number, without entailing any difficulties in tracing them. Sometimes serials are given both volume numbers and a running number, which may seem superfluous but is not serious. There is a danger, however, in the practice of using the year itself in place of a volume number. An entry giving the life of a serial as, for example, No. 1, 1958–No. 3, 1960, would appear to imply that only three numbers ever appeared. This would not be the case if the issues had appeared at, say, monthly intervals, and were numbered anew for each publication year. This is often the way in which East European serials are numbered.

There are also serials which are not numbered at all but only dated. This is ill advised except perhaps in the case of annual publications. Apart from this the main problem caused by dating of issues, whether or not they are otherwise numbered, is a discrepancy between an issue date and the actual date of publication. It seems to me that both dates should be indicated in an entry but with the emphasis on the issue date.

At least a consistent system of numbering, whatever its nature, does not create the problems caused by multiplicity and variation of numbering. I have already referred to the matter of multiple numbering in speaking of the presence of series titles in addition to a more specific title. The British standard on periodicals recommends that a new sequence of numbering should be used where there is a change of title, and, indeed, there is difficulty in locating particular issues of a publication when numbering is continuous through title changes. Dividing a continuous publication into successive series may be less popular today then it was in the nineteenth century, but I would suggest that the phrase 'new series' should not be used in conjunction with a change of title, and if a new series of numbering is adopted the numbering of the previous series should certainly be discontinued.

The method of indicating a serial's numbering is perhaps most important in recording the actual holdings of a particular library where these do not run from the first issue. Many libraries do no more than list their 'current titles' or give only a broad indication of the dates of their holdings. Such lists are better than nothing, of course, but a detailed record in accord with a standardized scheme—such as that outlined in the Introduction to the new BUCOP—is far preferable.

As for the future: the number of serial titles published will continue to grow, and probably at an increasing rate. This will undoubtedly force libraries into even more withdrawals and transfers of 'sleeping' stock than they are engaged in at present. I hope that librarians will bear in mind that BUCOP should be notified of these transactions as well, since the flexibility of the punched card system permits us to 'back-write', in the Orwellian sense, so that the cumulations, and later revised issues of those cumulations, will present the most up-to-date record possible of the holdings of the co-operating libraries. At some later date we may also be able to embark upon a revision of the information as published in the original set of BUCOP and its supplement along the same lines as the current programme. Of course computers will probably become increasingly sophisticated and the time may come when a central computer record, which libraries can contact by a species of teletype, may make printed union lists obsolete, a majestic or terrifying prospect according to the point of view.

As for the new publication itself: I should like to ask that users of the new BUCOP should feel free to inform me of any errors they may detect in the work apart from those which immediately hit the eye. Minor errors can be adjusted in the cumulations while more serious errors would be corrected by a revised entry in the subsequent quarterly issue. I should also like to invite you to apprise me of any comments or criticisms you may have of the publication when it begins to appear; if any of these appear to justify any alteration the flexibility of the method of production makes this possible up to a point. I hope we have reformed this publication indifferently well but there is always room for a limited exercise of consumer sovereignty.

AUTHOR'S SUMMARY OF DISCUSSION

Among the points raised in questions two topics appeared to be of particular concern to the meeting. First, it was felt that the *World list* system of title abbreviations should be continued in some form in the new publication. The strong feelings of the meeting in this connection have been duly noted and detailed consideration will be given by the NCL to the introduction of a system of title abbreviations along the lines of those used by the *World list* hitherto. The actual form that the abbreviations should take will require thorough investigation, in as much as the fourth edition of the *World list* employs a somewhat different system from that of the earlier editions.

The other point concerns the listing of holdings of the publications of congresses, conferences, and the like, which are excluded from the scope of the new BUCOP. It seems to me that the recording of these publications requires a different approach from the recording of serials, and if there were a demand for it this should properly be the province of a separate publication. The *World list* gave the names—but no more than the names—of international conferences only. The NCL is currently compiling a separate card catalogue of conference publications, recognizing the fact that these constitute another of the 'difficult' categories, but while there may be such a thing as a 'serial conference', these publications appear to have more in common with books than with serials as such. Where conference proceedings happen to form the matter of an editorially independent serial, these will be found under the serial title in the new BUCOP.

Letter to the Editor

OBSOLESCENCE OF REPORT LITERATURE

Dear Madam,

We have recently completed in the Report Room of the Library of the Atomic Energy Research Establishment, Harwell, an analysis of the extent to which report literature in paper form (i.e. exclusive of microforms) over four years old is used, as shown by records kept during the year 1963. The results are of course primarily of interest to ourselves as an aid to deciding retention periods for various types of report but they may also be of interest to other libraries with large report collections. The figures are shown in the table.

AERE LOAN RECORDS OF PRE-1960 REPORTS DURING THE YEAR 1963

Origin of report	*Date of report*											*Totals*	*% of grand total*
	Pre-1950	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959		
Atomic Energy Research Establishment	151	45	57	92	113	170	183	223	320	378	526	2,258	59
Other United Kingdom Atomic Energy Authority Establishments	2	—	—	1	1	9	13	11	44	44	91	216	5
United States	86	36	43	68	93	74	83	140	142	182	263	1,210	32
Other foreign atomic energy projects	2	—	3	—	5	9	8	7	11	14	37	96	2.5
Others (i.e. British and foreign firms, research associations, universities, Government Departments	—	—	2	—	1	6	12	6	4	4	9	44	1
Totals	241	81	105	161	213	268	299	387	521	622	926	3,824	

Note: Total issues of reports from AERE Library Report Room in 1963 were 53,514.
The size of the collection is estimated at 255,000 reports plus 80,000 microcards and microfiches.

The small use of earlier reports originating from 'Other UKAEA establishments' and 'Other foreign atomic energy projects' is a reflection of comparatively low output of reports before the early 1950s.

The total of 3,824 represents reports lent both internally within AERE and externally to other establishments of the United Kingdom Atomic Energy

Authority and to British and foreign organizations and libraries. It also represents only 7 per cent of the total business of the AERE Library Report Room, i.e. 93 per cent of the section's business is with reports in paper form less than four years old and with microforms, which present no storage problem. It is thus a clear indication of the rapid rate of obsolescence of most reports, a rate which is probably double that for periodical literature.

The figures lead us to the somewhat obvious conclusions that there is a long life span of use for our own documents and for other organizations' documents in immediately related subject areas, coupled with a very short life for reports originating from non-atomic energy organizations.

Yours faithfully,

C. W. J. WILSON,
Deputy Librarian

Atomic Energy Research Establishment,
Harwell,
Didcot,
Berks.

22nd April 1964

SELECTIONS FROM THE RECENT LITERATURE

ALL ITEMS listed may be borrowed from the Aslib Library, except those marked *, which may be consulted in the Library.

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MEMBERS' ADVERTISEMENTS

The charge for advertisements in these columns is 4*d* per word, minimum 5*s*. An additional charge of 6*d* is made for the use of a box number.

ABILITY AND SERVICE. Technical or commercial translations into/from Dutch and German. Speller-Kuijpers, FIL, NGV, 6 Lakeside, Ealing, London W13. ALPerton 1045.

WILFRED E. GOODAY, ARSM, DIC, MIMM, FIL. Member of Translators' Guild. Rumanian and French. 161 Rivermead Court, London SW6. Renown 1912.

TRANSLATIONS FROM TURKISH. All subjects. F. P. Scott, 4 Uphill Grove, Mill Hill, London NW7.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. STAmford Hill 8564.

TRANSLATOR OF SCANDINAVIAN LANGUAGES, ten years' experience. Member of Translators' Guild. J. T. Craddock, Ekard, Ray Park Avenue, Maidenhead, Berks. Maidenhead 24931.

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LIBRARY ASSISTANT required, primarily to assist in the compilation of card indexes. Some knowledge of languages and of chemistry (e.g. to O level GCE) an advantage. Previous experience of library work not essential but the position offers a good opening for anyone interested in embarking on a career in this field. Applicants should reply in writing to the Paint Research Station, Waldegrave Road, Teddington, Middlesex.

LIBRARIAN (woman) required in Head Office, Ferranti Ltd. Duties involve responsibility for routine library services and information work for both technical and administrative departments and provision of similar facilities to other factories in the Manchester area.

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IMPERIAL CHEMICAL INDUSTRIES LTD has a vacancy in the Head Office Library for a Senior Library Assistant. ALA standard with knowledge of chemistry. Duties include cataloguing. Write, giving particulars of age, education, experience and salary desired, to Staff Officer (Women), I.C. House, Millbank, SW1.

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THE BRITISH STANDARDS INSTITUTION requires a Documentation Officer. The work will be primarily concerned with the completion of the English edition of the UDC but also with committee work on British Standards and international recommendations for bibliographical references, abbreviations for periodical titles, transliteration and document reproduction. Applicants should possess a working knowledge of German or French. A starting salary of up to £1,000 is envisaged and will be dependent on age, qualifications and experience. The post is pensionable. Apply to the Establishment Officer, B.S.I., 2 Park Street, London W1, quoting reference (DO) and giving a brief résumé of education, qualifications and experience.

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WRITE (preferably by postcard) to Civil Service Commission, Savile Row, London W1, for application form, quoting 5906/64. Closing date 2nd July 1964.

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Offers are invited for a complete set (roughly 20,000 cards) of *Solid State Abstracts* covering the years 1957–63 inclusive. Replies to the Librarian, C.E.R.L., Cleeve Road, Leatherhead, Surrey.

Harwell

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Aslib Proceedings

Incorporating Aslib Information

Library Staff – a Fresh Look at Education for Special Libraries in an Age of Expansion

[illegible]

ASLIB · 3 BELGRAVE SQUARE · LONDON SW1

Aslib Proc. vol.16 no.7 p.207-226 London, July 1964

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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 **July 1964** **Number 7**

ASLIB CALENDAR 1964

September

MON. 28 – THUR. 1 October. 38th Annual Conference at University of Exeter.

October

MON. 5 – FRI. 9. Course on abstracting and co-ordinate indexing. See paragraph below.

THUR. 8. Technical Translation Group meeting at Aslib, 4 p.m. 'Soviet information services'.

THUR. 15. Repeat of advanced course on patents—the new European patent system.

THUR. 22. Evening meeting at Aslib, 5 for 5.30 p.m. 'What is classification?', by J. R. Sharp.

TUE. 27 – FRI. 30. Junior introductory course to special library and information work.

November

FRI. 13. Technical Translation Group sherry party.

December

MON. 7 – THUR. 11. Repeat of course on abstracting and co-ordinate indexing.

Birthday Honours

Hearty congratulations are extended to Miss M. Gosset, B.SC., A.R.C.S., who has received the M.B.E. in the Birthday Honours. Miss Gosset, who is Librarian of the Atomic Energy Research Establishment, Harwell, is a member of Aslib Council and is well known to Aslib members through her attendance at conferences and meetings and her generous service on Aslib Committees.

Course on Abstracting and Co-ordinate Indexing

In response to the widespread interest in co-ordinate indexing among Aslib members, which has been expressed at two recent one-day conferences, Aslib will sponsor an experimental presentation of the course in abstracting and co-ordinate indexing which was developed for the Engineers' Joint Council in America by the Battelle Memorial Institute, and has since been presented not only at centres all over the United States but also in Scandinavia and Switzerland. The purpose of the course is to create the highest possible efficiency in the utilization of literature by abstracting and co-ordinate indexing according to a system that does not require the use of complicated equipment. Individual research workers, as well as large organizations with well-developed information services, can derive great profit from the method. The course includes a large percentage of practical work in addition to lectures. A training manual and other documents are supplied and no additional reading or preparation is required. The course will be given by John C. Costello, Jr, who has considerable experience of developing information systems with E. I. Du Pont de Nemours and Company and Jonker Business Machines, and is now Director of the Information Systems Research Group, Battelle Memorial Institute. The course will be held in London from 5th to 9th October 1964 and if there is sufficient demand it will be repeated from 7th to 11th December. All students must have had either a formal education up to degree standard or else considerable experience in either scientific and technical work or a special library or information department. The fee for the course will be 45 guineas. A full programme of the course is enclosed in this issue, and applications should be made on the form enclosed in it. Applications *must* reach Aslib by 31st August.

Electronics Group Conference

A record attendance marked the sixth Annual Conference at Ashridge from 5th to 7th June, which was attended by seventy-six people. The conference got off to a resounding start with a lecture on stereophonic sound by Dr Manley, of Hendon College of Technology. An impressive array of equipment demonstrated the contrast between mono and stereo, with examples ranging from the Beatles to the Saint-Saëns second piano concerto.

In opening the Saturday morning session, 'Computers, mechanization and documentation', Mr H. F. Vessey, of the Ministry of Aviation TIL, described the early stages of mechanization introduced into the documentary activities of TIL and gave his views on future possibilities. He felt that computer operation was not only possible but would show major advantages. Dr M. P. Barnett then described some of his computer work in the United States and what he was at present doing at the University of London. He felt that it was within the province of every librarian to make a contribution to computer documentation, but urged the use of small punched card machines, Flexowriters, etc., before contemplating computers.

On Saturday afternoon the library staff of Hatfield College of Technology showed visitors the library, the facilities offered by HERTIS, and the microfilm and document reproduction services.

On Sunday morning there was a symposium on indexing and information retrieval systems, with lively discussion. The conference ended with an admirably lucid paper on 'Recent advances in plasma physics' by Mr P. A. H. Saunders, of the UKAEA.

Engineering Group

After an extended hibernation, which some mistook for death and said so, the Engineering Group marked its re-emergence with a conference at Leamings ton Spa during the week-end of 23rd–24th May. Upwards of fifty delegate- supported the venture, which also included the Annual General Meeting of the Group. Apart from one contribution, the tenor of the programme was metallurgical, with a roughly equal number of papers devoted to industrial and technological matters and to documentation.

The opening paper (presented by Mr J. Williams on behalf of Mr J. Negus) was essentially a run-down on the multiplicity of organizations that comprise the United Kingdom iron and steel industry. Despite the bewildering complexity of the industry, the random outside inquirer stood—according to Mr Negus—a good chance of being directed to the correct source of information. In his own paper Mr Williams (BISRA) referred to the challenges that are facing our iron and steel industry and went on to illustrate how the industry was answering them by heavy investment in research. Mr R. J. Garland (Rubery-Owen) elucidated the metallurgists' approach to the classification of irons and steels and soon had the conference immersed in the technicalities of melt conditions, alloying, heat treatment, etc. The Saturday session concluded with a contribution on the librarian's ideas on classification by Mr J. P. Saville (Iron and Steel Institute), who recounted the role played by his Institute in developing the UDC iron and steel schedules.

The Sunday morning session was given over to examining sources of information and literature on tool steels (Mr V. C. Watts, PERA), fasteners (Mr B. H. Vickery, GKN), and welding (Mr T. D. Stephens, BWRA). In the final address to the conference Mr C. Morgan (ICI)—surrounded by sundry plastic articles—very expertly summarized plastics technology and the application of plastics in engineering.

At the Annual General Meeting of the Group the following officers were elected for 1964–5: Chairman, Mr G. P. Sweeney; Committee, Mrs K. Bourton, Dr D. J. Campbell, Mr D. E. Clarke, Mr J. Day, Mr R. Sewell, Mr D. P. Woodworth.

Textile Group

At the Annual General Meeting of the Group at Boston Spa on 7th May, Miss Thornton, of TMM (Research) Ltd, was elected Group Chairman in succession to Mr W. R. Evans (Lace Research). A vacancy was left on the committee by Mr Evans' resignation, and Miss Needham, of the Cotton Board, was elected to the committee. Mrs M. I. Lomax, of Tootal Broadhurst Lee Co. Ltd, was re-elected Secretary.

Teach Yourself Librarianship

This is the title of a new book by Barbara Kyle, Research Librarian at Aslib. It is written in the witty and sensible way that we should expect from her and a selection of her ideas and captions have been amusingly illustrated by Gillis Pye. There is a practical chapter on building up a personal library and, though the book is primarily intended for the amateur, there is a supplement on training for the would-be professional. *Teach yourself librarianship* is published by the English Universities Press, 1964, in the *Teach Yourself* series, price 7*s* 6*d.*

Aslib Membership List

The *Aslib Membership List 1964* is now available. It replaces the *Aslib Year Book* which was published from 1956–7 to 1961–2. The *Year Book* contained, besides the list of members of Aslib, preliminary and supplementary material much of which may now be seen elsewhere. The list in its new form comprises a complete list of members arranged under the headings of the country in which they are located and, as in the *Year Book*, a list of corporate members classified by broad subject interest. Copies may be ordered from Aslib, price 17*s* 6*d* to members, 40*s* to non-members. An advance order form was enclosed with the June issue of *Aslib Proceedings.*

Society's New Library

The new library of the Bath and West and Southern Counties Society was opened on 6th May; this was the culmination of four years' work by the sub-committee appointed to completely reorganize the library and produce a printed catalogue. The society was established in 1777 and the first printed catalogue of the library appeared in 1864. The new catalogue, compiled by Mr Peter Pagan, B.A., F.L.A., Director of Bath Municipal Libraries, and Mr Philip Bryant, A.L.A., a senior member of his staff, records many valuable early works on agriculture and the technological arts and, in particular, works of importance in the wide region covered by the society. The catalogue contains eighty-six pages (about nine hundred entries) and is available from the society, price 3*s* post free. Use of the library is primarily for members but may also be granted to students and research workers on application to the Secretary, Bath and West and Southern Counties Society, 3 Pierrepont Street, Bath.

The Use of Biological Literature

A short course on the use of biological literature will be held at the Bradford Institute of Technology on Thursday and Friday 22nd and 23rd October 1964. It is believed that this course, which is being organized by the Department of Biological Sciences and Chemical Technology at the Institute, is the first of its kind to be held in this country. The course is intended primarily for new graduates beginning a career in research but will be of interest to all concerned with information work in the biological, biochemical and pharmacomedical fields. Lectures will be given by biologists and specialists in the literature, who will direct practical work in the Institute's new library, and the course will end with a visit to the National Lending Library for Science and Technology at Boston Spa. Further information may be obtained from Dr H. R. Wyatt, Bradford Institute of Technology, Bradford 7.

North-Western Polytechnic Courses

A series of part-time courses is being arranged at the School of Librarianship, North-Western Polytechnic, for 1964–5. For the *Entrance examination* course there will be a choice of two courses, one on Monday evenings from September 1964 to June 1965 and one on Tuesday mornings from January to December 1965. These are open only to applicants holding full-time paid posts in libraries.

There will be a *Conversion course* from February to December 1965 which is planned for students with not more than four papers in the new syllabus to complete, of which not more than three are in Part II.

A *Part-time course for whole of new syllabus* will be held for 'exceptional cases'—such as older students and those who are unable to obtain release for full-time courses; and a *Part-time graduate students' course* for graduates who wish to join the full-time postgraduate course as part-time students, for Part II (this will be a three-year course).

All inquiries should be endorsed *Part-time courses*, with name of the course, and should be sent as soon as possible to Department of Librarianship, North-Western Polytechnic, Prince of Wales Road, London NW5.

Annual Report of FID

Members who do not regularly see the *Revue Internationale de la Documentation* may like to know that the annual report of the International Federation for Documentation is now available, as vol. 31, no. 2, 1964. The *Report of the Secretary General on the activities of the Federation in 1963* contains a review of the programme of FID and synopses of the work of the different departments and services. These include, for example, notes on the International Study Conference on Classification Research (to be held in Elsinore in September 1964) and on the compilation of a directory of national technical information services and a world inventory of abstracting services. The *Revue Internationale de la Documentation* is published by FID, 7 Hofweg, The Hague.

UDC Schedule for Nuclear Science and Technology

A special edition of the UDC classes in the atomic and nuclear field based on the code of practice of the United Kingdom Atomic Energy Authority and with the co-operation of the International Atomic Energy Agency has just been published (*Universal decimal classification: special subject edition for nuclear science and technology*, The Hague, International Federation for Documentation, 1964. FID 351).

The schedule is a balanced selection, with full notes and directives, of the 'core' subject and its fringe subjects. The sections on nuclear and plasma physics and technology and particle accelerators have the status of the full international edition (although this is not stated explicitly) and the relevant topics from other parts of the UDC come from the abridged edition—mathematics, mechanics and physics, chemistry (analytical, inorganic, industrial), health and safety, materials testing, electrical and electronic engineering, workshop practice and metallurgy. A detailed alphabetical index of five thousand entries accompanies the systematic schedule. A brief introduction to UDC and a list of nuclear reactors in various parts of the world are also included.

This edition is available from the British Standards Institution, 2 Park Street, London W1 (price 64*s* 7*d*), or from the International Federation for Documentation, 7 Hofweg, The Hague, Netherlands (price 25 *guilders*).

Automation in the Library

How automation of the processing routines in the conventional library may be effected via a 'total systems approach' is described in a brief but clear paper entitled *Automated routines in technical services*, by Patricia T. Sievers and Paul J. Fasana (L. G. Hanscom Field, Massachusetts, Air Force Cambridge Research Laboratories, AFCRL Research Library, 1964). A brief review of the current market of equipment and techniques is followed by an account of the AFCRL Research Library 'monograph processing system'. This covers preliminary search routines using an MP-3 Polaroid camera, cataloging routines making use of various machine-generated authority lists, bibliographic encoding and catalog-card generation using tape typewriters, and the special-purpose data-processing device, the Itek Crossfiler, developed for this library. Copies of the paper may be requested from US Department of Commerce, Office of Technical Services, Washington 25, DC.

WRU Metallurgical Searching Service

The report of an *ad hoc* committee set up in 1960 by the National Academy of Sciences has now been published (*The metallurgical searching service of the American Society for Metals—Western Reserve University: an evaluation*. Washington, National Academy of Sciences, National Research Council, 1964. Publication 1148). It contains useful summaries of two operations research studies (by the Stanford Research Institute and by Arthur Andersen & Co.) of the problems of developing objective measures of effectiveness of IR systems; a summary of a survey of the users' service and their reactions to it; an account of some parallel searches made for the committee by different organizations and the committee's evaluation of the results; and a summary of the Cranfield test of the WRU index.

Readers of the intensive report by Mrs Jean Aitchison and Mr Cyril Cleverdon on the last-named test and of Mr Ivor Wayne's *Survey* (of users of the service) will find little new in this report. But it is a very clear and useful summary of a quite complicated and substantial literature concerning this pioneer of mechanized IR services, and as such is highly welcome. Copies may be ordered from the Printing and Publishing Office, National Academy of Sciences, National Research Council, 2101 Constitution Avenue, NW, Washington, DC, price $2.

Engineering Documentation Systems

In *Aslib Proceedings*, July 1963, there was published a letter by Lt-Colonel Kingsbury T. Jackson, ORDC, requesting information on the state of the art of engineering documentation. Lt-Colonel Jackson has recently written to inform members of Aslib that his study of current and future US Government engineering documentation systems was published in the fall, 1963, and that copies may be requested by anyone having access through a US Government contract, from Defense Documentation Center, Cameron Station, Alexandria, Virginia. The accession document number is AD-417583.

The New BUCOP

The first quarterly issue of the combined *British Union Catalogue of Periodicals* and *World List of Scientific Periodicals*, which was due in March, appeared in June. It is disappointing in content and appearance; entries are produced from punched cards so that no typographical variation is possible, but the legibility could have been improved by indenting the location symbols and removing the space between them and the title to which they relate.

In arrangement the *World List* form of entry is followed; a full explanation is given in an introduction. To compensate for the loss of the Bucop form, reference is made in an index of sponsoring bodies both to titles which are distinctive and to those incorporating the name of their issuing body.

New library symbols have been devised but appear to be unnecessarily complex, particularly in the use of a digit rather than a mnemonic initial to distinguish between the separate libraries in an organization or area. Holdings are listed in three sequences: libraries with complete runs from the first issue; those with complete runs from a later, specified, part, and those with imperfect, partial or temporary holdings. Unfortunately, where there are twelve or more libraries in the first, or first and second, categories, locations for the second and third, or third, categories are excluded. Consequently the true holdings of any library included in the publication are not necessarily shown, and it is apparently useless for locating local loan copies of journals if more complete files are held in large libraries at a distance, not necessarily with lending facilities.

The catalogue is issued by Butterworths, 88 Kingsway, London WC2. It will be cumulated in two editions, one full and one for scientific (*World List*) titles only. Subscription rates are respectively £7 15*s* and £7, to include the four issues and the appropriate volume.

New Library Science Quarterly

The first issue of a new quarterly has just been published, entitled *Library Science with a slant to Documentation.* It is sponsored by the Sarada Ranganathan Endowment for Library Science, in collaboration with the Documentation Research and Training Centre, Bangalore. The editor is Dr S. R. Ranganathan (who now ceases to be editor of *Annals of Library Science*) with assistance from an international editorial board. The new periodical covers all aspects of library science; vol. 1, no. 1, March 1964, includes papers on the 'Design of depth classification: methodology' by Dr Ranganathan and on 'Whole government as author: comparison of CCC and ALA Code' by A. R. Desai. Subscriptions ($8 annually) should be sent to the Sarada Ranganathan Endowment for Library Science, DRTC, 112 Cross Road 11, Malleswaran, Bangalore 3, India.

Colloquium on Special Library Problems

The text of three papers given at a meeting of the Library Association Reference, Special and Information Section North-Western Group on 3rd December 1963 is now available in mimeographed form. The papers are 'Identifying and locating standard specifications' by R. Astall; 'Some shortcomings of *Chemical Abstracts*' by D. Kaye; 'Trademarks' by A. L. Smyth. It was felt that the information given in these was of such practical value that it should be given the opportunity of wider circulation. Copies will be sent free of charge on receipt of a stamped foolscap envelope and should be requested from Miss Nancy Wright (Hon. Secretary of the NW Group) at Information Section, UK Atomic Energy Authority, Risley, near Warrington, Lancashire.

Trade Associations and Professional Bodies of the United Kingdom

Mrs Patricia Millard has advised us that the second edition of her reference book *Trade associations and professional bodies of the United Kingdom* will be published by David Fanning Associates in August. This book has no connection with any other directory of a similar name or title published by any other concern. Copies will be available at 42*s* post free from the publishers at 50 Ewart Grove, London N22.

NEW MEMBERS

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TAKING STOCK—A FRESH LOOK AT EDUCATION FOR SPECIAL LIBRARIANS IN AN AGE OF EXPANSION

JACK BIRD, M.A., F.L.A.
Education Officer, Aslib

Chairman, L. G. Patrick, F.L.A., Librarian, Aluminium Laboratories Limited
Evening meeting, London, 22nd April 1964

RATHER more than a year ago, on 26th November 1962, Mr Patrick read to an Aslib evening meeting a paper entitled 'Some implications of the new Library Association syllabus from the special library viewpoint'.* The situation which he discussed there was known to be causing some concern to special librarians. The new Library Association examination syllabus gave students far more opportunity to specialize than had ever been possible before, and to this extent it went a long way to meeting the demands that special librarians had been voicing for many years. But as the arrangements for teaching it became known, many aspects of them seemed likely to cause difficulty to special libraries. In future the main emphasis of professional library education was to be on full-time study, and the majority of recruits to the profession were expected to go to library school straight from school or university without previous experience of work in a library. What part-time instruction was available would mainly be organized on a day-release basis, instead of evening classes as in the past. Furthermore, owing to the difficulty of providing instruction in the wide choice of alternative papers proposed, it was expected that teaching would be concentrated in a small number of library schools. As a consequence of this it was anticipated that libraries would reorganize their staffs so as to separate professional from non-professional duties, and there were plans—far from definite at this stage—for a separate Library Assistant's Certificate to cater for the training of non-professional staff. For a number of reasons it was feared that these arrangements would hit special libraries particularly hard. There seemed little prospect that libraries would be able, under the proposed arrangements, to recruit staff with the scientific knowledge or the familiarity with industry which many special librarians felt to be essential. It seemed quite out of the question that the majority of special libraries would ever be able to release staff for full-time education, and for very small libraries, which were known to be numerous, even day-release presented almost insuperable difficulties. Moreover, in these same small libraries, the separation of professional and non-professional duties was also difficult, and many special librarians felt that it would be difficult to organize work if the supply of librarians in training were to dry up. The discussion that was aroused by Mr Patrick's paper, both at the meeting and in correspondence after, made it clear that the doubts and fears about the new syllabus were widely held by members of Aslib, although there were also those who held that these doubts were largely based on misunderstandings, and that when the new arrangements came into operation it would be found that special libraries would not suffer. The Aslib Education Committee decided that more concrete information on the actual situation in special libraries was needed, and so it was decided to send to all members a questionnaire designed not only to find out what special librarians felt about the new arrangements but also to assess as far as possible what would be the actual effect of the new arrangements on member libraries and their existing staffs. Accordingly a questionnaire was drafted and tested, and sent to all members in the summer of 1963.

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* *Aslib Proceedings*, vol. 15, no. 1, January 1963, p. 18–30.

The replies to the questionnaire were disappointing. This was probably due in part to faults in the questionnaire, though a pilot questionnaire sent out in advance to a sample of members had failed to show these up. Possibly it was also due to the fact that the questionnaire was sent out during the holiday season. Only about 10 per cent of the membership returned the questionnaire completed. Moreover, of those that were returned, a great many were filled in so carelessly that it was difficult to place great reliance on their answers. For instance, many members stated that if part-time classes for the Institute of Information Scientists' examinations were started in their area, some of their staff would be likely to attend, whereas replies to a previous question showed that there was no one on their staff with the qualifications necessary to sit for the Institute's examinations. When asked if they would wish other tuition to be provided if part-time tuition for the Library Association's examinations were not available, many members failed to answer the main question, but answered subsidiary questions about the form of tuition preferred. But even with all its faults the questionnaire showed that some of the difficulties for special libraries were not as substantial as one might have been led to suppose. Of the libraries who replied 76 per cent had some provision for release of staff for training during working hours, for periods ranging from half a day to two days a week, and when asked which form of part-time training they preferred, more voted for day-release than for either evening classes or correspondence courses. Of those replying 63 per cent thought it would be possible for them to recruit staff direct from library schools. Altogether 42 per cent anticipated staffing difficulties under the new arrangements, but over half of these thought they would be overcome by the provision of part-time classes for the Library Assistant's Certificate—a figure that was undoubtedly affected by the uncertainty as to the nature of the certificate, as was shown by many comments on this question. The overall impression one got from the replies to the questionnaire was that people did not seem to be prepared to give the problem the serious thought which it really required, and that some at least of the fears that had been expressed were not as well founded as one might have been led to suppose from the discussion.

The same general impression is given by various other investigations into this problem. The Northern Branch of Aslib had only a short while before sent out to its members a questionnaire designed to assess the demand for the provision of courses for special librarians not preparing for the Library Association examinations, and the replies to this showed a very similar pattern.

Again there were only a very small percentage who replied, and although there was quite a widespread interest in the provision of classes, the demand for classes of the same kind in any one area was hardly enough to justify the provision of courses. Since then I have seen the results of a number of investigations carried out by different organizations to assess the potential demand for part-time classes for partly qualified librarians who have to take some papers under the new syllabus to complete qualifications started under the old—the so-called 'pipeline'. All these show the same pattern: the overall numbers interested in the provision of classes are much smaller than anyone had been led to suppose, and the demand for individual papers is so scattered that it is difficult to get enough students in any one place to constitute a viable class.

Meanwhile further indications that the real position was very different from what many people had supposed had come from another direction. The library schools had begun to recruit for the first full-time courses to be held under the new syllabus, and they reported that the demand was so heavy that they were forced to be very selective, and in some cases to reject nearly half their applicants. Moreover, the standard was so high that they were confident that they would experience no difficulty if the Entrance Examination were eliminated, and only students with two GCE passes at 'A' level were admitted. On the other hand, most of them were making some provision for part-time training for people who were not able to take full-time training, and they reported that most of the requests for part-time training came from students who were below professional standard, and should more properly have been studying for the Library Assistant's Certificate. Here was a clue to what was really wrong with the questionnaire. We are in fact dealing with a situation that is changing all the time, and changing rapidly, mainly under the pressure of influences coming from outside the library profession altogether. The questionnaire, and investigations like it, can only reflect at best the present situation, and in many cases even the past. If we are to plan successfully for the future of our profession—which is after all what education for librarianship is all about—we must try and assess the factors in the world around us which are going to influence the position of our profession, and to anticipate the effect that they will have.

One important factor of this kind is the gradual acceptance of the idea of information services by organizations of many different kinds. This cannot be proved statistically, but it is something that is experienced by many people in the profession. The steady expansion of Aslib membership only tells a fraction of the story. Aslib is frequently approached by firms and other organizations who are planning to set up a library or information department and ask for advice, and other organizations having a good information service of their own are often approached in the same way. This does not always operate to the benefit of the profession. In many cases the management concerned have formed wrong ideas about what is required of an information department, and having asked professional advice refuse to follow it. One common idea of how to staff a library is to put a redundant typist in charge. Another is to get a management trainee to 'look into the information problem' and 'set up a system' which junior staff will be expected to run. Even an employer who is prepared to appoint a professional librarian and pay him, may not be willing to provide him with the staff or equipment necessary to do his job efficiently. Educating such employers is a very long-term task. There is also another side to this problem. Even when an employer is willing to appoint professional staff it may often prove difficult to find a person with the right background willing to work for him, particularly, as is often the case with industrial posts, when it is in an unattractive area. This means that there is likely to be a steady expansion of the number of jobs available, creating a demand which present resources find it difficult to supply.

Another and more explosive factor that is likely to have an effect on the position of education for special librarians is the rapid expansion of higher education proposed in the Robbins report. As this gets under way a flood of graduates will be let loose on society transforming it in ways which cannot fail to have a profound effect on the provision of trained librarians. In the first place there will be many more graduates available from whom librarians can be recruited. More important perhaps, as there will be more graduates available in all walks of life, employers will get used to employing them and will eventually demand them in a much wider range of posts than hitherto, including probably libraries. To meet the demands of the increased numbers, university libraries will need to expand and will require more staff. Lastly it is likely that universities will be interested in the training of their graduates for professional posts and as a result we shall probably see the establishment of more library schools attached to universities.

Library schools at universities have been slow to develop in this country compared with other advanced countries, but already there are signs of a quickening interest. The first school was founded at University College London in 1919, and until recently was the only library school in this country attached to a university. Now, the school at Sheffield University will open its doors this year, a school is in active preparation at Queen's University, Belfast, and it seems likely that the existing library school at Glasgow will in due course become part of the new University of Strathclyde. The advantages that would come from library schools at universities are many. Undoubtedly the presence of a considerable body of practitioners trained at graduate level would increase the status of the profession as a whole. There would be a much greater likelihood of attracting graduates to library work if they knew they could be trained at university level. Library schools in universities would have in the libraries on their own campus direct access to a greater variety of materials than is available to many existing libraries, and this would avoid the need for making special arrangements for tutorial sessions in libraries which have no direct connection with the school. There would be opportunities for co-operation with other departments in the organization of teaching. Lecturers from other departments could teach the literature of their subjects to librarianship students. This would avoid many of the difficulties which existing schools find in teaching subjects in List C of part II of the Library Association syllabus. On the other hand, lecturers in librarianship could teach the use of the literature, and of library and information services, to students in other departments. This could produce students who would value information services and expect to find them in the organizations in which they were employed. Co-operation might also exist in other spheres. At some universities there might be schools of librarianship and of information science (and possibly other related disciplines such as archive administration) existing in close co-operation, sharing teaching in subjects of common interest and enriching their students with an awareness of the needs of their related disciplines. It is worth noting here that already plans are being made to extend courses in information science to other institutions from their modest beginnings at the Northampton College of Advanced Technology. There would undoubtedly be greater opportunities for research in schools attached to universities. But probably the greatest advantage would be a long-term one. The existence of a library school in a university, taking an active part in the work of the university in co-operation with other departments, could create a climate of opinion in which graduates would accept library and information services as an important part of intellectual life, and expect to find them in any institution in which they are employed. The experimental work in teaching the use of the literature to graduate students carried out by the National Lending Library has shown something of what can be done in this direction, and the work of tutor librarians in technical colleges is having a similar effect at a lower level, but it is in the universities that the main effect must come. The form of university library courses has not so far received much discussion. Existing courses are all post-graduate ones, but it has been suggested that it might be better for students to take a degree in librarianship with opportunities to develop the study of a special subject, on the analogy of the training of teachers. But, because special library and information work demands specialized subject knowledge, it would seem that, in these fields at any rate, a post-graduate course would be preferable. In the United States in recent years, more attention has been given to taking higher degrees in librarianship.

If this seems a desirable and practical development, then we must be prepared to move towards it. This implies that we should not build up elaborate machinery for training for professional qualifications at a lower level. On the other hand we must recognize that this will take time to develop, and that during the intervening period at least there should be some opportunities for part-time education for those who cannot attend full-time library school. There are sixty-one institutions listed in the Library Association *Students' handbook* as offering part-time classes, but it is not known how many classes have actually been established. Perhaps one of the most useful things that Aslib can do in this connection is to help channel the valid demand for part-time education and translate it into suitable courses.

Another implication of the move to raise the status of professional qualifications is that we must do something about the training of junior staff. Professional and non-professional duties will have to be separated as far as possible, and non-professional staff will have to have their own status and prospects of advancement, and also their own training. Much of the difficulty in the change-over to the new examination structure has stemmed from reluctance to accept this. There has been considerable controversy about how non-professional training should be organized. Many large libraries feel that they can adequately provide this by means of internal training schemes, but others, in particular many university libraries, think that they cannot. Certainly small special libraries cannot hope to do so. From the beginning there was provision for a

Library Assistant's Certificate as an integral part of the new examination structure, but the Library Association has been slow to implement it. Many public libraries feared that such a certificate might be used by bad authorities as an excuse for dilution of labour. This fear is a very real one, but bad employers exist just as often in industry and would be just as likely to seize on any excuse for dilution; most special libraries are prepared to risk this, because they do not see any other way of organizing the necessary training. It is also the policy of the Ministry of Education to encourage the establishment of training schemes for staff at this level in all walks of life. It now appears likely that the Library Association will eventually accept some form of training and certification for non-professional staff, but before this materializes there will be much for Aslib to do. The initiative for setting up courses will probably be made at a local level, and Aslib may help here also to channel the demand and translate it into suitable courses. The content of the courses is also still unspecified, and will have to be worked out. Most of the suggestions that have been made in the discussions within the Library Association have envisaged a course largely confined to teaching students to carry out efficiently the routines in the library in which they work and to understand their purpose, and have proposed that the certificate should be awarded on the basis of course work rather than examinations. But this view is not held by everybody. Members of SCONUL have demanded more emphasis on comparative and background material, and routines in special libraries are so diverse that it would not seem possible to devise a suitable course for them based mainly on existing routines. It is obvious that there is much here which must be worked out, and in which special librarians have a vital interest.

I have left till last what is almost certainly the most important topic, and this is the overall planning of the development of professional education. We cannot leave it to chance or to empire-building to determine what kind of schools are wanted and how many of them there should be. This could lead either to a shortage of trained staff or to over-production. Planning, if it is to be efficient and humane, should aim at producing enough trained people at all levels to meet the needs of libraries and information departments as they develop. To do this it will be necessary to have information of a kind that we do not possess at present. We do not even know with any accuracy how many people of various grades are employed in libraries at present, especially in special libraries. For planning purposes, you would need in addition to be able to evaluate conditions, and establish what staff libraries *ought* to be employing; and then you would have to allow for the factors of growth and development. The totals thus obtained would possibly need to be broken down on a geographical basis to determine the location of schools. Aslib Education Committee had become aware of the need for such a study and was considering ways of setting it in motion with properly qualified staff, when it learned that other organizations were contemplating action in the same direction. The DSIR Information Committee was planning to conduct a survey of the present numbers and likely demand for information staff, and the North-Western Polytechnic was hoping to appoint a research assistant to conduct an investigation into the future demand for librarians. In the circumstances Aslib Education Committee

Letter to the Editor

INDEXES TO REFERENCE BOOKS

Dear Madam,

The sad answer to Mr G. Burger's interesting suggestion (April 1964) is that the separate offer and sale of indexes to scientific books could never possibly be done without financial loss. As he mentions, such indexes would never amount to more than a few extra sheets; no one will pay more than a few pence for a few sheets of anything; it costs just as much to advise scientists about such a pamphlet as it does about a 10 guinea book; and the problems of stocking such trifles, and the fiddling accountancy involved, are alas impossible to entertain.

Yours faithfully,

P. J. EDMONDS,

Chairman, Technical and Scientific Group.

The Publishers Association,
19 Bedford Square,
London WC1.
28th May 1964

SELECTIONS FROM THE RECENT LITERATURE

ALL ITEMS listed may be borrowed from the Aslib Library, except those marked *, which may be consulted in the Library.

Books and Pamphlets

ASSOCIATION MARC BLOCH
Draft of final report on a general system for the treatment of documentary data (application to physiology and human sciences). Part I. Theoretical applications of Syntol. Paris, Euratom, 1963. 91 p. Translation of a study prepared by J. C. Gardin of the Association for Euratom.

ASSOCIATION MARC BLOCH
Draft of final report on a general system for the treatment of documentary data. Part II. Programming of Syntol (Syntagmatic Organisation Language) on IBM 7090. Paris, Euratom, 1963. Various paging. Translation of a study prepared by R.-C. Cros of the Association for Euratom.

*BRITISH COUNCIL *and* ROYAL SOCIETY OF MEDICINE
A select list of British medical periodicals: an annotated guide. London, British Council, 1963., 100 p.

DAVIS, RICHARD A., *and* BAILEY, CATHERINE A.
Bibliography of use studies. Philadelphia, Pa, Drexel Institute of Technology, 1964. i,98 p. mimeog. Covers the use of the literature of engineering, science, social science and the humanities.

DERWENT PUBLICATIONS LIMITED
. . . Patents manual, 1964. London, Derwent, 1963. 68 p. 12*s* 6*d*.

DIJK, MARCEL VAN
Enregistrement et recherche de l'information documentaire, . . . méthodes-moyens-coûts, guide pour le choix d'un équipment. Bruxelles, Presses Universitaires de Bruxelles, 1964. 164 p. 225 *frs.B.*

FRANCE. Délégation Générale à la Recherche Scientifique et Technique. Comité d'Etude Documentation
Rapport à Monsieur le Ministre d'Etat chargé de la recherche scientifique et des questions atomiques et spatiales. [Paris?] 1963. 52 p.

INTERNATIONAL BUSINESS MACHINES CORPORATION. Data Processing Division
Reference manual: glossary for information processing. White Plains, NY, the Division, 1963. 23 p.

LIBRARY ASSOCIATION. Library Research Cttee
Some problems of a general classification scheme: report of a Conference held in London, June 1963. London, the Association, 1964. 47 p. Financed by a grant from the Scientific Research Fund of NATO. 10*s*; 7*s* 6*d* LA members.

LIBRARY ASSOCIATION. Reference and Special Libraries Section. West Midlands Group
Library resources in the West Midlands, ed. by Brian Gerrard Staples, 2nd ed. London, the Section, 1963. x,90 p. 28*s*; 21*s* LA members.

MANCHESTER. Public Libraries
What's available in the technical library [by] F. R. Taylor, 2nd ed. Manchester, the Library, 1964. 29 p.

POLZOVICS, IVAN
Adatok és felismerések a szakirodalmi dokumentáció történetének kezdeteihez [Data and perceptions to (sic) the early history of documentation] Budapest, Országos Müszaki Könyvtár és Dokumentációs Központ, 1964. 79 p. Includes English contents and abstract.

*PRICE, DEREK J. DE SOLLA
Little science, big science. New York, London, Columbia University Press, 1963. xv,[1],115 p. 33*s* 6*d*.

Articles and Papers

BLAKE, JOHN B.
Medical records and history. *American Archivist*, vol.27, no.2, April 1964, p.229–35.

HUDSON, KENNETH
Bibliographical review 1: Industrial archaeology. *Technologist*, vol.1, no.1, January 1964, p.14–18.

JONES, AUBREY
Some comments on Trend. *Technologist*, vol.1, no.1, January 1964, p.19–24.

KING, JAMES W.
The project on the history of recent physics in the United States. *American Archivist*, vol.27, no.2, April 1964, p.237–43.

LIBRARIES Bill: M.P.s discuss authors' and publishers' interests. *Bookseller*, no.3046, 9th May 1964, p.1850–4.

OREKHOV, P. M.
New regulations on the obligations and rights of scientific organisations. *NLL Translations Bulletin*, vol.6, no.4, April 1964, p.338–48. Translated from *Nauchno-technicheskaya informatsiya*, no.8, 1963, p.3–5.

MEMBERS' ADVERTISEMENTS

The charge for advertisements in these columns is *4d* per word, minimum *5s*. An additional charge of *6d* is made for the use of a box number.

ABILITY AND SERVICE. Technical or commercial translations into/from Dutch and German. Speller-Kuijpers, FIL, NGV, 6 Lakeside, Ealing, London W13. ALPerton 1045.

WILFRED E. GOODAY, ARSM, DIC, MIMM, FIL. Member of Translators' Guild. Rumanian and French. 161 Rivermead Court, London SW6. Renown 1912.

TRANSLATIONS FROM TURKISH. All subjects. F. P. Scott, 4 Uphill Grove, Mill Hill, London NW7.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. STAmford Hill 8564.

Appointments vacant

THE ARCHITECTURAL ASSOCIATION requires an experienced qualified cataloguer for up to two years to revise the catalogue. Experience of UDC essential. Knowledge of architecture preferred. Appointment from August 1964 or later. Further information from the Librarian, 36 Bedford Square, WC1.

FRESHWATER BIOLOGICAL ASSOCIATION. Vacancy for Librarian, Windermere Laboratory. Science degree. Salary not less than Executive Officer, Civil Service (£641 (age 21)–£1,236). F.S.S.U. Apply: Director, The Ferry House, Far Sawrey, Ambleside, Westmorland, before 15th July.

IMPERIAL CHEMICAL INDUSTRIES LIMITED. PAINTS DIVISION has a vacancy for a TECHNICAL TRANSLATOR in the Division Library and Information Service. The ideal candidate will be one with a sound knowledge of chemistry or physics, preferably up to degree standard and with ability to translate accurately and quickly from German into good English with, in addition, a working knowledge of French and Russian, and possibly Italian or Spanish. He or she will also have had experience in abstracting and information work and be under 45 years of age.

If you feel you come somewhere near this specification please apply to the Personnel Officer (Technical Departments), I.C.I. Paints Division, Wexham Road, Slough, Bucks. (The post has much variety and involves daily contact with members of technical departments; it is permanent and the conditions include a five-day week and pension and profit-sharing schemes.)

A SCIENTIST wanted to form and head a group concerned with information retrieval and searching for an expanding firm of Chartered Patent Agents in London. Applicants should preferably be graduates with a predominant interest in chemistry. Please reply to Box 464, Aslib.

A SCIENCE GRADUATE, or equivalent, is required for proof reading and patent searching by a firm of Chartered Patent Agents in the Holborn district. Excellent working conditions, salary bonus scheme and luncheon vouchers. Please reply with full particulars, stating salary required, to Box 465, Aslib.

G.K.N. Group Research Laboratory, TECHNICAL INFORMATION. The Information Section, which provides a technical information service to the G.K.N. Group of steel-making and metal-working companies, has a vacancy for an Assistant Information Officer, under 30 years of age, whose duties will include reading, abstracting, indexing and dissemination of information, answering technical inquiries and making reports.

Ideally, applicants should have some experience in a technical library, or information department, and be qualified in scientific or technical subjects. A reading knowledge of German and French would be useful.

If you are interested in a career in information science please send details of age, qualifications and experience to the Personnel Officer, G.K.N. Group Research Laboratory, Birmingham New Road, Lanesfield, Wolverhampton.

BRITISH INDUSTRIAL PLASTICS LTD (a member of the Turner & Newall Group). B.I.P. CHEMICALS LTD have a vacancy for a TECHNICAL INFORMATION OFFICER in their Technical Department at Oldbury. The work is concerned with the writing of technical literature for publication and also the preparation of reviews for internal circulation. It will also involve assisting in the compilation of the Library News Bulletin and development of the Keydex information retrieval system which has recently been introduced.

A knowledge of scientific German, French or Russian would be useful but the main requirement is an ability to write fluently in English.

The company offers excellent conditions of employment including a contributory

Pension and Life Assurance Scheme. Applications should be made in writing giving full details of qualifications to the Personnel Manager, B.I.P. Chemicals Ltd, Popes Lane, Oldbury, Birmingham.

REQUIRED: AN INFORMATION OFFICER to supervise and contribute to the work of an existing information unit surveying the chemical field. The products of the unit are sold commercially.

The job requires accuracy, hard work and administrative ability. It would suit an information officer in a chemical company who would like to take on the responsibilities connected with the direct sale of his work. Please send details of experience to Box 664, Aslib.

IBM UNITED KINGDOM LTD require an ASSISTANT LIBRARIAN in the Library at their Head Office at Wigmore Street, London W1. The library deals with technical and commercial information relating to data processing and its applications and includes a large collection of computer programs. At present it has a staff of seven people. The work will include answering of inquiries, supply of programs and participation in the general work of the library. The initial salary will depend on experience and qualifications. If you are aged about 20–25, are a Chartered Librarian or have a good grounding in library skills and have nearly completed the LA Registration examination, have a wide general knowledge and are willing to learn the principles of data processing, wish to help expand the library and information service, please write to the Manager of Personnel Selection, 101 Wigmore Street, London W1, quoting reference GA/AS/183.

Wanted

Economist for 2nd and 16th March 1963. Librarian, Lanchester College, Coventry.

For sale

The National Union Catalogue, a cumulative author list (Library of Congress catalogs) 1958–1961 (five clothbound vols. a year. 1962 (six paperbound vols.). Offers to the Librarian, Chatham House, 10 St James's Square, London SW1.

BRITISH AIRCRAFT CORPORATION

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Please apply in writing to:
Senior Personnel Officer,
British Aircraft Corporation,
Six Hills Way, Stevenage, Herts.

BRITISH AIRCRAFT CORPORATION

Aslib Proceedings

Incorporating Aslib Information

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Aslib Proc. vol.16 no.8 p.227-272 London, August 1964

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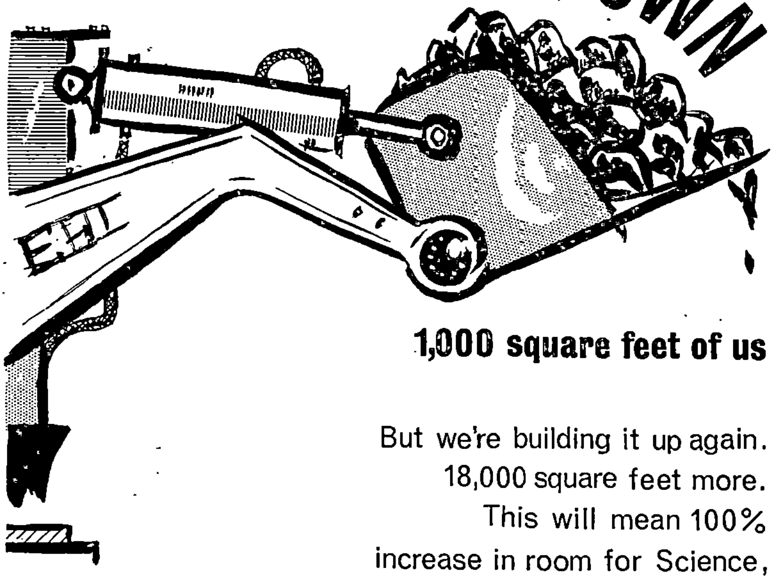

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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 August 1964 Number 8

ASLIB CALENDAR 1964

September

MON. 28 – THUR. 1 October. 38th Annual Conference at University of Exeter.

October

MON. 5 – FRI. 9. Course on abstracting and co-ordinate indexing.

THUR. 8. Technical Translation Group meeting at Aslib, 4 p.m. 'Soviet information services'.

THUR. 15. Repeat of advanced course on patents—the new European patent system.

THUR. 22. Evening meeting at Aslib, 5 for 5.30 p.m. 'What is classification?', by J. R. Sharp.

TUE. 27 – FRI. 30. Junior introductory course to special library and information work.

November

TUE. 10. Aslib fortieth anniversary reception. See paragraph below.

FRI. 13. Technical Translation Group sherry party.

THUR. 26. Evening meeting at Aslib, 5 for 5.30 p.m. 'The challenge of the new British universities'.

December

MON. 7 – THUR. 11. Repeat of course on abstracting and co-ordinate indexing.

Honorary Officers of Aslib

Members will be pleased to know that Lord Shackleton has kindly consented to serve as President of Aslib for a second year. His interest in information matters and his activity on behalf of Aslib have been of inestimable value, and the Association has every reason to be grateful for the helpful and energetic way in which he has carried out the duties of his office.

We are also pleased to record that Sir Reginald Verdon-Smith has consented to serve as one of Aslib's four Vice-Presidents for a second three-year term, and that Mr D. T. Richnell has agreed to serve as Honorary Secretary for a further year. Mr Richnell has filled this office with distinction for four years and, unfortunately for Aslib, this fifth year must be his last, in accordance with the current rules of tenure. Under the same rules, Mr G. Weston has now retired from the office of Honorary Treasurer—an arduous and frequently thankless task which he has shouldered for five years with good humour and a nice concern for Aslib's financial fortunes. He has been succeeded by Mr A. H. Holloway, an Individual Member of Aslib who is professionally employed at what, in less complicated times, was known simply as the Admiralty. We extend a warm welcome to an old friend in, for him, a new office.

The Council of Aslib

We should like to take this opportunity of extending our heartiest congratulations to Mr L. G. Patrick, of Aluminium Laboratories Ltd, on being re-elected Chairman of the Council for the current year; also to Mr J. R. Stocks, of the Shell International Petroleum Co. Ltd, on his election as Deputy Chairman. Both have given freely of their time to Aslib in many capacities in the past, and can be relied upon fully to assist the development of Aslib's interests during the year.

A welcome is also extended to Mr R. Snel, of the Shell International Petroleum Co. Ltd, who joins the Council for the first time as a result of this year's elections. The other eight successful candidates have all given periods of service on the Council in the past and Aslib is deeply appreciative of their continuing interest. They are: T. M. Aitchison, L. J. Anthony, D. V. Arnold, W. Ashworth, R. L. Collison, L. G. Patrick, P. H. Sewell and R. C. Wright. There was a strong field of nineteen candidates for the nine vacant places, and the Council hopes that the ten who were unsuccessful this year will not be deterred from offering themselves for election next year.

Aslib Fortieth Anniversary Celebration

It has been decided to mark the fortieth anniversary of the foundation of Aslib by a reception to be held by kind permission of the Trustees of the British Museum in the King's Library at the British Museum, on Tuesday 10th November 1964.

This will be an evening dress occasion lasting from 8 p.m. to 10.30 p.m. and there will be music, drinks and a buffet supper. Admission will be by ticket for which there will be a charge, which will be kept as low as possible so as to enable a substantial number of members to attend. Further details will be issued as soon as possible.

Junior Introductory Course

A junior introductory course to special library and information work will be held at Aslib from Tuesday 27th to Friday 30th October 1964. It is intended for students who have recently taken up junior posts in special libraries and information departments, and is designed to provide those who are occupied mainly in routine duties with an understanding of their work and its place in the organization which will help them improve their efficiency and give them an incentive to progress to more exacting tasks. The course will include lectures on various aspects of library and information work, visits to other libraries and information departments and a final discussion session which will include ways of following up the course with further study. The fee for the course will be six and a half guineas.

A programme of the course is enclosed in this issue, and applications to attend should be made on it. As these courses are usually heavily over-booked, intending students are advised to book early. Provisional bookings will be accepted by telephone or telex. Students holding a university degree or in a senior position will not be accepted for this course, and are advised to wait for the senior introductory course, which will be held in November.

Programme for Future Aslib Meetings and Conferences

From time to time in the past, members have made suggestions for subjects which they would like to see included in the programme of Aslib meetings and conference. This kind of co-operation is very helpful and it is much hoped that in the future still more members will come forward with requests for specific subjects for programmes. These are welcome at any time, but most of all in the early autumn, when the committees are beginning their work for the new season.

Suggestions should be made in writing and addressed to Aslib for the attention of the Meetings Organizer.

Retirement of Miss Betty Newton

Miss Betty D. Newton, Librarian of Imperial Chemical Industries Ltd Headquarters, retired on 31st July. Miss Newton, who joined ICI in 1929, worked in the Library at Head Office and became Librarian in 1947. She is well known to many Aslib members and has taken a special interest in the activities of the Chemical Group. She has frequently welcomed Aslib Groups on visits to ICI Library, and in 1961 she acted as hostess at ICI's reception to the delegates of the FID Conference. Members will want to express their wishes to Miss Newton for a happy retirement.

Technical Libraries: Users and their Demands

This is the title of a new report being issued by the Aslib Research Department. The sub-title is *A classification of user groups and user demands in technical* *libraries*. As this indicates, the main purpose of the investigation, which was carried out by Mrs Margaret Slater, was to identify groups of users having distinguishable patterns of demand on technical libraries, so as to help librarians to tailor their services and holdings to meet the needs of their users. In this pilot survey, which is to be followed by a full investigation, it was found that scientists as a group differed markedly in their demands from engineers, and that people working in industry differed still more markedly from those working in academic institutions.

The report is based upon analysis of the results of a detailed survey, conducted by questionnaire and observation, of each 'act of library use' which took place in twenty-five sample technical libraries on a test day. It gives the results in detail, describes the methods employed in the investigation, and discusses the significance of each of the findings for technical librarians. An order form for the report is enclosed with this issue of *Aslib Proceedings*.

Document Transmission by Closed Circuit Television

A member of the Aslib Research Department was recently shown the closed circuit television apparatus now operating as a link between the drawing office and the workshop floor at the Marconi Company's works at Basildon, Essex.

In the Print Store in the drawing office an industrial TV camera is mounted over a translucent-topped desk. Tracings are back-lit through the desk top, opaque material is lit from above by floodlights. The camera has a motorized zoom lens and is mounted on a pan and tilt head, so that the viewer, by operation of the simple controls at the viewing end, can point the camera at whatever part of the drawing he wishes to view, and can increase the magnification at will.

The signal is carried from the transmitter to the six viewing points by coaxial cable. (Other methods of distribution, such as microwave, are available. Using coaxial cable, some form of signal amplification is needed if the distance between transmitter and receiver is more than about two thousand feet, but in this particular application the distances are of the order of a few hundred feet only.) Operators at the outstations call up the master station by depressing a foot switch which must stay depressed throughout the call. This switch lights one of six indicator lamps at the master station which immediately indicates who is making the call and the master station operator selects this outstation and asks which drawing is required. The drawing is placed on the desk, the appropriate light switched on and the picture switched through to the outstation. The operator at the outstation is able to steer the camera and zoom the lens in and out to get the information that he requires. When he is satisfied he releases the foot switch and the whole system is then open for somebody else to make a call.

It proved practicable to read a page from *Proc. IRE* using the system. Half a page occupies the whole screen area at the degree of magnification which gives adequate legibility, and the controls allow the whole page, and the whole opening, to be scanned.

Although no practicable page-turning mechanism yet exists it is feasible that this system could be used by information services to transmit document-images to their users without the necessity of physical conveyance of the document. A practical example might be communication between the British Museum Library and the National Reference Library of Science and Invention.

Fuller details are available from Aslib Research Department.

Computer Typesetting

A Computer Typesetting Conference, sponsored by the Institute of Printing, was held at London University on the 7th–9th July. Over 250 delegates attended from many countries. Computer typesetting embraces two widely differing technologies and is a relatively new subject. The object of the conference was to provide a clear definition of the state of the art.

Much of the development work in this field has been done in the United States, although research in this country is being carried out at the universities of Newcastle and London.

Basically, a computer-aided typesetting process consists of three stages—input preparation, computing and typesetting. In the input preparation stage, keypunch operators perforate paper tapes or cards which contain the matter to be set in type and the specifications of typographical style and format. The computer then accepts this tape, justifies the lines, hyphenates word breaks and provides a print-out proof. Any corrections that are indicated after proofreading are then inserted by the computer and the material is then laid out in the required page form. The computer then outputs punched-paper tape or magnetic tape which is used to operate filmsetters or hot metal casting machines.

Such a system is being used at the British universities mentioned above and in the United States at MIT and Rocappi Ltd. The Perry chain of newspapers in Florida has twenty publications produced in this way.

Delegates to the conference also heard of the considerable developments that have been made recently in high speed photocomposition techniques. The Linotron system will accept computer produced magnetic tapes and will set up to eleven hundred characters per second, the rate depending on the point size. It includes the capability of page composition, and sets approximately ten average pages per minute, regardless of point size. A matrix of 256 characters is scanned by a cathode ray tube; video signals are produced, which are passed through a selection grating. The required character is selected as output and projected on to photographic film.

Another approach, used in the LUMIZIP machine (at present employed in the MEDLARS system) is to use conventional photographic matrices. Each character in the matrix is provided with a flush tube which can be triggered at the exact moment when the image of the selected character is at the proper place on a stationary piece of film. Displacement of the character images is obtained by a reciprocating lens. An image of all the characters travels across the film and the tubes are flashed at the precise time when the image of the associated character is in the proper place in the line. The machine, built by Photon and now in use, has a speed of 300 to 500 characters a second, depending on the line length, size, etc. A member of staff of Aslib Research Department attended this conference and copies of his notes are available, free of charge to members, from the Research Department.

Machine Tool Translations Index

The Machine Tool Industry Research Association is to keep an index to technical translations on machine tool subjects. The project is aimed to ensure that the maximum possible use is made of translations, by making them known as widely as possible, and to avoid duplication. Participants will be notified of the source of new translations. MTIRA will not be responsible for making the actual copies available but it will, of course, assist its members to obtain them. Arrangements will generally be made directly between the holder of the translation and the inquirer.

The index has the support of the DSIR Machine Tools Co-ordinating Committee, but success can be assured only by the co-operation of all organizations or individuals sponsoring translations of technical interest to designers, manufacturers and users of machine tools.

Companies or libraries wishing to participate should get in touch with the Information Officer, The Machine Tool Industry Research Association, Hulley Road, Macclesfield (telephone Macclesfield 5421).

New Feature Card Devices

As a result of recent developments in the machinery for handling feature cards, new devices can now be made available. They include two ranges of feature card scanner and calculator (for 2,500-item and 5,000-item cards), and feature card interpreters which will print out lists of references from a stack of feature cards or feed these references into a teleprinter system. Computer input can be provided. Details of prices and other information may be obtained from Messrs J. L. Jolley & Partners Limited, Westbourne House, Westbourne Street, High Wycombe, Buckinghamshire.

New Book Collection

The United States Air Force Academy Library is to establish a memorial collection of scientific and technical books in honour of Theodore von Karman. Dr von Karman, who died in 1963, was renowned as an aeronautical and astronautical engineer and was the first chairman of the USAF Scientific Advisory Board. The acquisition of the collection will be supervised by Colonel George V. Fagan, the Academy's librarian.

Rutgers Seminar

The Rutgers University Graduate School of Library Service has received a grant from the National Science Foundation to continue its seminars on systems for the intellectual organization of information. The first three seminars were held during the academic year 1963–4 and the proceedings are being prepared for publication, beginning with Mr Jack Mills' study on the UDC. The next seminar will probably be held in November or December 1964 and it is hoped to announce the details in due course.

Unesco Publications on Africa

HM Stationery Office has produced a leaflet giving details of some recent Unesco publications on Africa. These include specialized maps, bibliographies, and scientific and social surveys, and some titles are *A review of the national resources of the African continent*, *Bibliography of African hydrology*, and *The teaching of sciences in African universities*. Copies of the leaflet and order form may be requested from HMSO, Atlantic House, Holborn Viaduct, London EC1, or from any HMSO bookshop.

The Recordak MIRACODE System

The Recordak Division of Eastman Kodak Company have recently announced that their MIRACODE System is now available in the United Kingdom. MIRACODE stands for *Mi*crofilm Retrieval *A*ccess *CODE*. Members of the Research Department attended a recent demonstration of this equipment.

Documents and their related codes are recorded on 16 mm microfilm. The coding is accomplished in the form of clear and opaque rectangles (binary code) on microfilm; in the MIRACODE System each descriptor is assigned a three digit number. After processing, the film is loaded into a self-threading magazine, each magazine holding up to 100 feet of microfilm.

The centre of the retrieval system is a special Lodestar Reader-Printer. Average access time to a required document page is eight seconds; a hard copy (at a cost of 7½*d* per page) can be obtained by pressing a button. Search programmes are set up on push-button keyboards and up to fifteen keyboards can be connected according to the searching depth requirements of the application. Descriptors need not be coded in any predetermined sequence, hence this system can be used for a conventional co-ordinate index.

Each column of code on the film contains three numeric characters. An example of the image-packing density in the MIRACODE System would be as follows: assume four columns of code per document (i.e. up to twelve descriptors per document) so that each document contains an average of six pages; approximately 2000 document page images, with their related retrieval codes, could be stored on 100 feet (one magazine) of film.

The cost of the basic system, which would include a microfilmer, keyboard cabinets, retrieval keyboard and Lodestar reader-printer (with control logic) is of the order of £10,000.

Exhibition of Library Architecture

An exhibition called 'A pictorial history of library architecture' is to be held at the Building Centre, London, from 2nd to 19th September. It will display photographs and drawings of many of the world's famous libraries, and has been prepared by the Italian Building Centre (Palazzo dell' Edilizia, Genoa). The exhibition will be open from 9.30 a.m. to 5 p.m. on weekdays and 9.30 a.m. to 1 p.m. on Saturdays. Further information may be requested from the Building Centre, 26 Store Street, London WC1.

Aslib Aeronautical Group Thirteenth Annual Conference

Aslib Chemical Group First Annual Conference

College of Aeronautics, Cranfield, 9th–11th April 1964

AN INDUSTRIAL INFORMATION SERVICE: THE EFFECTS OF GROWTH ON ITS ORGANIZATION AND ADMINISTRATION

D. V. ARNOLD, B.SC., F.L.A., F.I.INF.SC.
Intelligence Section Manager, Imperial Chemical Industries Ltd, Heavy Organic Chemicals Division

WHEN I was asked to give a paper at this conference the subject as presented to me was 'the organization of information in a large company', and I accepted this at its face value. As I thought about it, however, I wondered whether it might not be more interesting to give a reasonable amount of attention to the growth aspect as well as to the eventual stage when an information service can justifiably be called 'large'; in other words, I might try to indicate—as I saw them—some of the changes in, and consequent problems of, a company information service as it develops from its infancy. I have no intention of defining what I mean by the word 'large'—someone once said that a small organization is one that is destined to become medium sized, the medium sized is one preparing to grow large and a large one is one that wishes it were small—and would instead refer you to the Aslib survey[1] in which this question of size of information services is given some consideration. I shall have to hope that when you finally hear, in the description I give you, of the amount of time that has to be given to various activities and the number of different activities that have to be performed, you will agree that I am referring to what may reasonably be called a large information service.

I have designed my paper in the hope that it may interest primarily those of you here who are in charge of small, but growing, company information services, in the sense that you may be warned of some of the changes that may take place and of the administrative and organization problems that may consequently arise. I realize only too well the dangers of generalization, and I would emphasize that most of my statements are in a sense personal opinions and impressions gained over a large number of years and possibly too much governed by the particular experiences that I have had. Perhaps, however, some of the things I say may, during the discussion, provoke opinions and views that will be far more interesting and useful than those that I myself may express.

What then may we regard as the likely problems of administration and organization that will arise as a company service has to face growth? As I see it these will come mainly from the company's increasing interest in information in both depth and breadth, from the sheer physical aspects of growth, which will mainly give rise to difficulties in communication, and from changes in scientists' fundamental approach to their needs for information.

I think I must start in rather an elementary way by outlining some of the early stages of development, as I see them, of an 'average' company information service. Such services commence frequently by the establishing of a technical library aimed at providing an organized and controlled collection of published material, which consists essentially of books, periodicals and other forms of literature in the fields of interest covered by the company concerned. Very rapidly, and sometimes almost simultaneously, a 'specialized information function' is added to the normal, general information function that any library, however small, attempts to provide for its customers. This specialized information function sets out to direct information to specific users in an active rather than in a passive fashion. It often takes the form of establishing the information services's own secondary sources of publication, such as bulletins of titles of articles in periodicals (and, possibly later, abstracts of such articles) rather than leaving the users to depend entirely on the primary sources (the periodicals themselves) and/or on the *published* secondary sources such as periodicals, abstracts and lists of current titles.

The abilities of the library service to control the lending, cataloguing, indexing, filing, etc., of published material soon points to that service as being the obvious control point for carrying out similar functions for the internal reports issued by the company. A stage is thus reached where two major functions have been developed, namely *a*, the recording/lending/circulating function, both of published and unpublished (report) material, which I shall call the 'library function', and *b*, the specialized information function which sets out, on behalf of the service's customers, to exploit to the full and in an active manner the material that is collected. The two functions may happily exist side by side for quite a time, with the volume of work not justifying the allocation of any one person full time to either of them, and each likely to be limited in standard according to the abilities and qualifications of the staff employed. A stage is eventually reached, however, when the work has increased to a point at which one or other of the two functions becomes large enough in volume to justify the full-time attention of at least one qualified person. This may be either a suitably (usually technically) qualified person brought in to deal with the specialized information function or a professional librarian to deal with the library function, which will include the general information function to which I have already referred, and which will be concerned mainly with those interests of the company that are not highly technical and to cover which the library collection will almost certainly by then have been extended to deal. Either of the two main functions may, of course, be performed by the person in charge of the service, depending on his particular qualifications. Administration will be occupying only a small proportion of his time and according to which of the two functional roles he is best qualified to assume—namely the library or the specialized information function—so an appropriately qualified extra member of staff will be needed. Assuming, and this is more often the case, that it is the specialized information function that first needs full-time professional attention, the proper employment of a suitably qualified person able to devote all his time to it will enable more attention to be paid to the qualitative, quite apart from a quantitative, aspect. This will be particularly seen in the attention that may now be given to bulletins dealing with items from periodicals. It is reasonably likely that in the previous stages of development titles only—or at the best very brief annotations—will have been produced, and that a minimum of critical evaluation of the value of the articles will have been possible. The growth of the company, which has led to the growth of the information service, is likely to bring with it an increased interest in technical aspects of information, whether in depth, breadth or both, and it will therefore be all the more important that the resulting increase in published material to be examined should be scanned more critically, both in order to deal with the increase in volume and to make sure that the time of readers is not wasted in being directed to information that is not of value.

As soon as any administrative unit finds it necessary to employ specialists of different kinds—and this is the stage we have now reached—who need to work in close co-operation with each other, personnel problems may arise due to the different outlooks held by the different specialists. Such problems are very easily exaggerated, and in information services too much attention has been drawn in the past to disputes between professional librarians and technically qualified information scientists—as we may call those engaged on the specialized information function—about the appropriate roles that the two should play in the service. Be that as it may, at the stage of development we are discussing the person in charge of the service will almost certainly be engaged for the major portion of his time on either the library or the specialized information function, and will thus himself be—if the phrase may be used—one of the possible protagonists in any likely conflict. This places him in a reasonably authoritative though somewhat biased position but, and this is the important point, it is at this stage that he must command from the other qualified person a respect and understanding for the qualities and expertise that he himself possesses, whether they be concerned with the library or the specialized information function. Both sides have something to learn from the other but more important still is that they should both appreciate that in an information service their functions are complementary and both equally necessary. Perhaps it is not beyond the bounds of possibility that the working together of librarians and information scientists may more rapidly help the former to appreciate the scientists' point of view and enable scientists to obtain a better appreciation of the useful part that can be played by librarians. The information scientists might perhaps explain to the scientific staff not employed in the information service, but interested in using it, that some of the apparent idiosyncrasies of librarians have, on closer examination, something to commend them!

It is at this stage that the person in charge of the service will be given his first real test as an administrator, and the success of this one problem alone will be of the utmost benefit in the subsequent stages of the service's growth. Management includes the need to make an efficient and happy team out of a number of persons who have the same ultimate goal in view, but have each of them individual tasks to perform in achieving this whilst possessing their own often very different outlooks and qualifications. The responsibility for making sure that the people involved work harmoniously with each other is obviously that of the manager of the information service, and it is essential for him at this stage—if he has not done so already—to make quite clear to each individual not only what is the latter's position in the organization of the service, particular job, and limits of responsibility, but the degree to which the success of the service as a whole depends on his performing his particular tasks efficiently. This will be only too evident when the service is small since the degree of efficiency of one member has a very noticeable effect, but it is important to drive the point home as a principle now, since as the service grows the effect of the degree of efficiency of any one member on the service as a whole is not so obviously seen.

The next stage to be considered emerges when *both* the library and the specialized information functions reach the stage of being full-time activities and the head of the service finds that he is having to spend very much more time on administration. At this stage he should be relieved of his particular functional duties and there should be one senior person engaged on each of the two main functions—library and specialized information—and both persons reporting independently to the manager. Further growth—involving addition of staff at a variety of levels—takes place in each function, both by a general increase in activity and by the development of new activities within the two functions. The organization problem will arise of deciding at what stage these new activities within a function should be separated and made into independent functions on their own, reporting directly to the manager instead of through the library or the specialized information function. I think we may say that as long as other persons in the function are reasonably qualified to perform the duties of the person engaged in the new activity, and if the work load of this activity justifies a maximum of one person working full time on it, then it is probably better *not* to make the activity into an independent function. This will allow—within reason—for a comparatively easy absorption of work load at times of crisis, since other persons in the function will—at least to a reasonable level—be able to take over the activity in an emergency. At the same time we should remember that by modern organization theory the number of functions should be increased as soon as possible since large rather than small spans of control are favoured.

Let us assume, for example, that we are still at a stage where only two primary functions—namely library and specialized information—are reporting directly to the manager of the service but a translating activity has begun to develop. This activity will almost certainly have been performed by those primarily engaged in the specialized information function, that is by the information scientists, since it is those persons who are probably the most skilled in foreign languages and have the necessary technical knowledge. A stage will be reached, however, when the work load becomes sufficiently high on translating to make it necessary to have at least one person working full time on this task. Since the translating activity can reasonably satisfactorily be performed by other persons in the technical information function, it is wiser at this stage to keep the translating activity as part of the information function. In this way emergency situations due to absence of the translator can be more effectively dealt with, since the person in charge of the specialized information function will have direct responsibility for maintaining the service. As soon, however, as the load of translating becomes capable of absorbing a second person's time, an emergency situation can be looked after reasonably easily even if the activity is separated off as a separate function and—what is far more important—the complete separation of these functions, that is the specialized information and the translating, will enable the particular—as opposed to the bare basic—expertises to be developed and strengthened in each case. One is only too well aware that both translating and specialized information work need their own particular skills but it will be difficult to develop these skills really efficiently until the two activities can be completely separated as responsible, independent functions reporting directly to the manager of the information service.

Many years ago the attitude of companies to the commercial and technical aspects of their business produced a rigidity in organization that made for very clear-cut distinctions between commercial and technical departments. This led usually to an attitude of comparative ignorance of technical matters on the part of commercial staff and of commercial on the part of technical. This situation is now quite changed and whilst, for example, even research staff are encouraged and expected to have a keen awareness of the commercial background to their work, so similarly the commercial staff have to appreciate the technical point of view to any commercial problem. This has had its effect on technical information services, and many of the larger ones have—whilst continuing with their purely scientific/technical services—added a more commercially slanted service, sometimes termed 'techno-commercial'. This is essentially an information service that keeps watch on announcements concerning products, with specific reference to new processes, figures for capacity and production, proposals for new plants, and other items of news of companies, generally of a commercial nature. This type of information calls basically to be performed by scientifically/technically trained staff, and at the level of commercial evaluation that is demanded, which is only small, is a proper part of the specialized information function. As soon, however, as purely economic information has to be dealt with the situation may eventually demand the employment of at least one economist who should be able to bring to the abstracting and disseminating activity an evaluative appraisal of a different kind from that able to be given to scientific/technical literature by his information scientist colleagues; he may even be called upon to carry out 'research into a wide variety of economic problems as they are encountered by other departments or by top management'.[2] We have now a situation somewhat similar to that which occurred when, faced with the need for staff of quite different training, we separated the library and information functions. For similar reasons we may now have to set up a separate economic information function.

At some stage it may be found advantageous to separate the recording/lending/circulating activities associated with published and unpublished material so that two independent functions of this kind operate. This makes it easier to control security and to provide the intermediate grade clerical staff interested in operating a file of unpublished information. Staff at this level who are keen on librarianship are both capable of and reasonably interested in the duties associated with unpublished material so long as it does not occupy an undue proportion of their time, but when two full-time clerks have to be employed on this work it will be found preferable to recruit them specially.

Further growth of the service is likely to give rise to administrative and organizational problems affecting individual functions in different ways rather than affecting the service as a whole, with the exception, of course, of those that arise from the dispersal of the unit geographically and general problems of accommodation.

I have referred so far principally to the professional and intermediate clerical aspects of the various functions of the information service but I should like to add a few words about the basic clerical activities on which all these functions so vitally depend. However well qualified and good at their job the staff who are in the top and middle strata may be, they will be unable to give of their best unless this basic clerical activity is sufficiently staffed in both quality and quantity and is well organized. The flexibility required in a clerical activity, taking into account also the greater number of staff changes that occur in this as opposed to the professional levels, is a strong argument for providing a common basic clerical service for all the functions contained in the information service. An added reason is that more efficient methods of working—whether by machine or other means—are more likely to be available at this lower clerical level and are more economically introduced for a common clerical activity of reasonable size than for a number of smaller, discrete units. Since the library function has the greatest need of a sound clerical corps, and in its very nature lends itself more easily to this activity, it should, in my view, whenever possible provide this common basic clerical service required by the other functions. All routine clerical procedures of any kind should, of course, be available in the form of a 'Procedure manual'—such a manual is not merely a guide to what is done, for purposes of reference, but a first-class indicator of imperfections which should then be remedied!

I have so far given no indication of any sub-division of a large information service other than by function. This sub-division by function is not, of course, necessarily the primary one, and in many large companies there is first a division of information services by the subject field covered. In most instances the information services have followed the pattern drawn up by the company, whose special interests are often separated geographically. This has usually led, by accident of birth rather than for any other reasons, to information services created to look after each major subject field and with little or no co-ordination or centralized control. That there is need for co-ordination or even some form of centralized control cannot be denied but up to now the economic arguments have not been strong enough to outweight the many advantages of having separate information services working as closely as possible to the people they are serving, since communication on this level has rightly been regarded as more important than communication between the separate information services. However, the completely new degree of economic working that can be achieved by using machine systems is causing large industrial information services to look again at the problem, since whilst the introduction of such systems may be quite unjustified at the level of working of the separate services, the provision of such systems at a central point may make them economically attractive. The chief point to realize here is that machinery should be used economically to provide tools that will be used at the decentralized service points and *not* that the central point will provide the service itself, since at the intimate levels at which the service is required it is essential that there should be the closest contact between the information workers and the users of the service.

The points I have made so far have nearly all been in connection with the effect of growth on the creation of separate, independent functions, and I should now like to consider how the very fact of 'largeness' affects some of these individual functions in the way they operate. Before doing so, however, I must say a word about one other general question, namely size as it affects communication, since in one sense of this word it is the *raison d'être* of the service itself.

Internal communication may deal very broadly with two different problems. We have firstly the communication of information that involves the direct working of the unit itself, in other words the very machinery of administration. This, of course, is common to all organized units and the problems of a large information unit differ little from those of any other. Secondly—and much more importantly—there is the internal communication, to all members of the service likely to be interested, of the information that comes into the service, whether it be published, unpublished, documentary or otherwise. Also, the larger the company the more difficult it becomes to obtain up-to-date knowledge of people's detailed current interests and the more valuable, as a source of information, become the questions and requests for service that are put to the various parts of the service. The regular, daily circulation, to all members of the service, of copies of memoranda, inquiry forms and other documents concerned with the service's business is one method—of a number—that may be used to improve this class of communication. The larger the service the more danger that there will be regularly held—but often quite unnecessary—meetings in the misguided belief that communication is being assisted. Meetings should be held only when necessary, be brief and to the point; handled in this way they are an efficient means of communication, handled inefficiently they are the most effective way of wasting time that I know. Each function in the service must realize also that some of the most important of their customers for information may be the members of the other functions in the information service. However, whatever other means are used for communication within the service the manager must realize that in the long run he must act as the information service's own information officer, making quite sure that on all counts the various functions in the service are obtaining the information they require in their own particular capacity as dealers in information.

To turn now to the effect of 'largeness' on some of the individual functions. By their very nature size is always of immediate concern to libraries, and although no industrial libraries can compare in size with most university and public libraries, growth is still an important problem, causing changes in function and bringing difficulties to the industrial librarian. One of the major problems affecting the library in a large information service is that of scatter, in other words the dispersal geographically of the departments and persons served. This—because it reduces the percentage of users who actually come to the service personally—can lead to dangers of lack of understanding of exact requirements, a decrease in speed of service, greater demands on the lending function, since fewer people come to inspect material in the library itself and more time spent on non-professional skills, for example the packing-up of material to be sent to readers. These are, of course, problems that affect any large library system, whether industrial or otherwise, and palliatives, since so often these are the most they are, can include the creation of branches of the library at suitable service points. Such sub-libraries will often serve as specialized centres for one particular subject or group of subjects; for example, in a predominantly chemical company a sub-library for engineering in the engineering department may be created or a commercial library in a building housing mainly commercial departments. Great as is the temptation—and even the pressure—to allow some of these sub-libraries, many of which will be very small, to be looked after as a part-time function of staff who are not themselves members of the information service, this should be resisted at all costs. It is far better to service a sub-library, needing one full-time member of staff only, by sharing the work on a part-time basis between members of the library staff. Such staff can frequently be engaged on library duties other than those immediately associated with the sub-library itself, if the duties connected with the sub-library, other than ordinary supervision, do not justify a full-time job.

It is particularly unfortunate, however, that scatter has this inevitable effect of decreasing the number of people who use the service direct, as industrial libraries tend more than any other libraries to suffer from what I shall euphemistically call 'shyness' on the part of their users. Many of these 'shy' types are keen users of the library but they nearly always make use of it by an indirect method such as by telephone or through another person; they never come to it personally. There are probably few industrial librarians who could not quote glaring cases of people who have possibly never—over many years of service—set foot in the library proper and probably do not even know where it is; they always use it either via an intermediate person or by some other form of indirect communication. Most such persons are to my mind to be pitied—they are in a sense not completely educated since they have never realized that occasions arise in the business lives of even the most active persons when no matter how busy they are, and how efficient their information officer, librarian or go-between may be, they themselves must satisfy their needs for information—this is of the very essence of their own power of creativity.

Growth does, however, bring with it certain advantages. At the early stages of an industrial library's development, its stock of periodicals is rarely of sufficient size, whether in number of titles or lengths of run, to be of much assistance to anyone carrying out an intensive literature search, and a certain amount of material will have to be borrowed from outside. At such a stage there is probably little advantage to be gained by keeping periodicals for reference use only, and in any case since there is usually not more than one copy of a title available there are no spare copies that can be kept for this purpose. However, as the library grows the direct contribution it can make to the needs of its readers will grow more rapidly than the requirements of those readers as regards broadening of their interests in information: the library begins to crystallize as a uniform collection with long runs of periodicals, and if—as is more than likely—most of the more important periodicals are subscribed to in duplicate, then runs of the major periodicals may usefully be reserved for reference use only. The stage is now set for the library to act—as a whole—as a useful reference library to which scientists will come to browse rather than merely to borrow, and in which they can find a rich collection of material capable of being used in an analytical and comparative manner from a reasonably historical standpoint. As I shall point out later, the value of the library function to pure scientists in industry is beginning to increase at the expense of that of the information function. For such scientists we need rather to arrange the collection in such a way that he can find what he wants by himself than to exploit the collection of information on his behalf.[3]

Use of the periodicals as a reference stock in this way will demand—though this may already have been achieved—that no library staff work in the library proper and that a reasonable degree of quiet prevails. This change in function, which obviously occurs only when a reasonable *research* use of the library is required, does, however, make it necessary to make the library self-usable as far as possible. Continual reference to library staff—whilst tolerable at a small level and where the individual reader probably requires only the isolated reference—is obviously out of the question when a detailed search is in progress needing frequent, and often rapid, reference to a variety of periodicals.

Turning now to the information function in a large information service the primary requirement of the abstracting activity—as in services of smaller size—is the ability to select information of likely interest and to assess its value to the organization. However, in a large company, which may have an interest in a very wide range of subjects, the second of these requirements is extremely difficult, if not impossible satisfactorily, to fulfil. The information scientists employed find very marked limits to the evaluative level at which they can hope to assess the major part of the information to be dealt with. It is possible, however, for them at least to assess—more particularly for those periodicals that do not employ a panel of specialized referees before accepting a paper—whether the article has scientific integrity. By this term I mean whether the author has revealed in his paper flaws in argument that are in essence unscientific, whether he has accepted false premises, etc. It is in assessing these values that experience in actual research on the part of the abstractors themselves is of value. Their own practical experience of what is meant by the research approach will frequently enable them to discover the 'coin that does not ring true'. It is in these days of prolific production of scientific and technical publication, much of it of a spurious nature, that it is all the more necessary that the poor material be rapidly spotted and rejected.

However, such is the volume of publication and the speed at which advances in techniques and knowledge are being made that many large industrial organizations catering for an extremely wide range of interests are finding it difficult to provide an abstracting service that will serve to an adequate standard all the scientific and technical staff employed. No doubt one contributing factor is the increasing productivity of the average research scientist, due largely to developments in supporting techniques, which has enabled him to make a more profitable use of his time. Unfortunately no improvements in abstracting techniques have been made from an economic standpoint, with the result that the individual abstractor's efficiency has remained about the same for many years.

As a company grows the amount of exploratory research increases; at the same time that of a more applied nature—as practised also in smaller companies—continues. Large industrial information services—whilst still serving reasonably satisfactorily on applied and technical aspects—are finding that they can touch the fringe only of many of the more specialized, fundamental branches of the pure sciences as needed by these exploratory research scientists. The resources and knowledge of such subjects possessed by information scientists can be only relatively superficial and those engaged in this exploratory work are tending to provide their own intimate information service in their own specialities. This movement is in industry still small but outside industry there are indications that it is becoming significant. As an editorial in *Science* stated:

> 'Men who are active in a fast-moving field know that only a limited number of workers are likely to make significant discoveries, and that they themselves can keep abreast of new developments if they are in close contact with those few. They also know that colleagues with whom they are not in contact, and even newcomers, will publish their findings in perhaps a half-dozen journals. It is not even necessary for each individual to scan this limited number of publications, for he will learn through the "grapevine" of anything particularly significant.'[4]

Such men come to form 'an invisible college' and meet in the 'small, closed symposium' rather than in the large national meetings. Assistance to such persons is getting too big a problem for us and the need is not to do their searching but to educate them to do it for themselves in the most economical way.[5]

In most large industrial information services today we would be bold if we could claim more than that the highest level at which we can select and abstract information is that sufficient to satisfy the scientist who is not a specialist in the subject. In other words, although we may be satisfying the technologist in his own subject field, we are satisfying the exploratory scientist in his fringe fields only. For the technologist, however, and industry is likely to employ many more of them of the highest calibre in the future, an industrial information service has still much to offer. Here the stress must be on active participation rather than active co-operation; in other words project teams of technologists should more frequently include information scientists as members.

What of information retrieval in industrial information services? Impatience with the present systems used by information services—not only industrial—

has been evidenced by scientists, many of whom seem peculiarly unappreciative of any difficulties, and imagine that all that prevents the push-button index from being available is the stupidity, mental laziness, or both, of librarians and information scientists. Extensive experiments on using computers in this work have been carried out by the efforts—individual and joint—of both scientists and information workers but, as the latter have so often been at pains to point out, 'the major difficulties of retrieval by computer do not lie in the hardware but in the means for identifying documents in terms of subject content.'[6] However, whatever means become available for improved information retrieval in the near future I have a suspicion that in large industrial information services the day of all-embracing, centralized indexes is coming to an end. Are we asking a too-distant—and I do not mean geographical but remote in depth of subject—and a too all-embracing centralized system to carry out a function for which it is not and cannot be designed? As specialized research work increases, it is becoming more difficult for the specific indexing needs of any specialized research group to be met by any form of centralized index; this follows almost automatically from my previous contention that even in the actual abstracting service we are not providing the specialized abstracts that are required and therefore will find it impossible properly to feed our own centralized indexes in an economic way. It is, in my opinion, more likely that one or more specialists working in narrow fields will have to keep their own indexes (*on their specialized subjects*) according to their own particular requirements and designed to cope with a restricted number of fields that have some reasonable relationship to each other, and make use of published indexing services tailored to the requirements of their particular subject and updated by computer methods. At the same time I envisage large industrial information services having to establish *a*, indexes covering broad subject fields, *b*, indexes to the more applied aspects of their companies' interests, and *c*, indexes to fields of interest of scientific and technical workers rather than to actual literature. In other words, I look to a considerable decentralization of the actual references, with intermediately staged indexes concentrating less and less on literature references and more on indications of topics and workers in the field. The work on citation indexes is of interest in this connection and many of us are looking forward to using the indexes of this kind that are shortly to be published.

My summarized advice to those of you with small but growing industrial information services is to look out for the appropriate times at which to reorganize certain activities and make them separate and responsible functions; to make sure that each function and activity is properly defined and that each person knows what is his particular job, whilst avoiding too watertight compartment situations similar to that in the story of the waiter who, when asked whether it was raining, replied 'Sorry, sir—this is not my table'; to realize that the library of your information service will tend to become more a silent storehouse of knowledge than a few shelves of frequently used books and periodicals; to remember that your information function is unlikely to keep pace with the increased demands made on it, and that in any case research scientists in very specialized fields are tending to become their own information officers in those fields; and to learn to accept wisely and cheerfully that in a large service the needs of such scientists are met better by having a first-class scientific library than a positive information function, except in so far as the latter can serve to relieve them of having to provide their own service in fringe fields. At the same time you should appreciate that your information function will become more important and more necessary to all the other members of your company—and they will be in the majority.

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CITATION INDEXES

E. M. KEEN, A.L.A.
Research Assistant, Aslib Cranfield Project

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A SCIENTIFIC paper usually contains a bibliography of earlier literature that has been consulted by the author during the course of his work, and the following up of such references has always been a fruitful and well-used method of tracing earlier information on a subject. Some figures given in a recent Aslib research report[1] confirm this. Of the twelve methods which a group of scientists used to seek information, the following up of references cited in relevant papers was the most popular method, practised by 80 per cent of the sample.

A *citation index* works in reverse: starting with an early paper that is known to be of interest, a citation index will list subsequent papers that have included it in their bibliography.

For example, an author of a paper (or journal article, report, etc.) can, by consulting a citation index, discover which authors have been using and quoting his original work. If an early classic paper on a subject is looked up (e.g. one by Einstein on relativity), then many of the later papers that have referred to Einstein's original one will be revealed. Figure 1 shows a page from a sample citation index,[2] giving recent citations to some of Einstein's papers—his 1905 article in *Annales der Physik* was cited by King and Rossi, and so on.

A suggested definition is 'A citation index is an orderly arranged bibliography, which lists cited publications, and the associated publications which cited them'.

Interest in citation indexes has grown greatly during the last few years, with quite a number being compiled, and one or two being commercially published. Most of this work is being done in the United States, where problems of compilation, arrangement and testing are being investigated, and a large body of literature has appeared. Citation indexes are not new, since Shepard's *Citations* is an old-established reference tool in the field of law. The application to science is more recent, with suggestions first made during the 1950s but work not beginning until the 1960s.[1] Support for this work in the United States is available at a high level, as the specific mention in the Weinberg Report[3] indicates. This brief introduction to the subject will mention problems of compilation and use and describe a related technique known as bibliographic coupling.

EINSTEIN A ------	*05*ANN PHYSIK ----------		17	549
KING AL	BIOC BIOP A	60	42	344
ROSSI C	NATURE	61	189	822
---------------	06–ANN PHYSIK ----------		19	289
ELWORTHY PH	J CHEM SOC	59		1951
VARADAIAH VV	J POLYM SCI	60	46	528
WHITNAH CH	J DAIRY SCI	59	42	227
---------------	06–ANN PHYSIK ----------		19	371
KING AL	BIOC BIOP A	60	42	344
---------------	07–JAHRB RADIOAKT ELEKT		4	411
DEBEAURE. O	COMPT REND	60	250	2149
---------------	08–ANN PHYSIK ----------		25	205
FIXMAN M	J CHEM PHYS	60	33	1357
---------------	08–Z ELEKTROCHEM ------		14	235
MAJUMDAR SK	NATURWISSEN	60	47	39

FIGURE 1

After some initial intellectual decisions have been made, actual compilation can be a clerical task, and is susceptible to almost complete mechanization. Manual compilation is possible, either by cutting up copies of the references or by writing or typing them out on slips, but the resulting sorting operation adds to the work and this method is too laborious for an index of any size. Punched card or computer techniques are better suited to the job and can list the references in a standardized and abbreviated format. But perfection is very difficult to achieve, since the variant ways of quoting the same paper may not all be recognized, resulting in the same cited paper appearing in more than one entry. Many of the decisions to be made at the compilation stage are concerned with problems common to most indexes but some are particularly critical in the case of the citation index.

Citation indexes have now been compiled for quite a few different subject areas. Some examples are: statistics, compiled by J. Tukey at Princeton University; atomic energy, compiled by B. Lipetz when at Itek; psychology, compiled at the University of Illinois; and physics and related fields, compiled at the American Institute of Physics. These are all experimental indexes, just one copy being produced for experimental purposes. However, the Institute for Scientific Information is now compiling indexes as a commercial publishing venture, covering the literature of genetics and also the physical and life sciences (the *Science Citation Index*). This large effort has been the work of a pioneer in the field, E. Garfield.

It is generally believed that the subject area to be covered should be as wide as possible, the ideal being the whole of science. This would aim to overcome the problem of 'scatter', when papers on a subject are frequently found in the literature of other subject areas. An attempt to overcome this problem in an index of limited subject area has been made by Garfield in compiling his 1961 *Genetics Citation Index*. The entries for this were extracted from the 1961 *Science Citation Index*, with its larger coverage of subject area and source journals. It is also suggested that the citation index may attempt to provide a universal bibliographical control of science literature.[4]

Small indexes covering a narrow subject area may prove to be useful, such as the one that is included along with the conventional author and title indexes to the papers given at the American Documentation Institute Annual Meeting, 1963.

The problem of exhausting all the known sources of literature on a subject is the same for all kinds of indexing. Most of the citation indexes seen so far are compiled predominantly from published journal literature and cannot claim to comprehensively cover a subject while valuable sources such as semi-published report literature are ignored. In the case of the *Science Citation Index* the source articles (the papers whose references are processed) are taken from about six hundred journals, and these 102,000 papers cite 890,000 unique articles, giving a total of over 1.4 million citations included in the index. This covers just one year, 1961, and illustrates that a wide subject area and only moderate subject coverage result in an index of some size.

The entry into a citation index is made by looking up a cited reference, and several arrangements of these have been tried, such as by author, title, date, or source reference. The most usual arrangement is an alphabetical one, under the first named author. In cases of multiple authorship entry under the other authors would double the size of the index and is normally not done.

The bibliographical details given in each entry are very sparse in current examples, with author's name and initials, journal title (highly abbreviated), year, volume and first page number only given. Absence of the title or any indication of the subject content of a reference means that during a search it is necessary to examine the item itself, or some other index, to establish whether the reference is of interest or not.

The need for frequent publication and provision of cumulated volumes is the same as for any published index. The *Science Citation Index* for 1964 is to appear in three quarterly issues, and an annual cumulation, but the cost will prohibit its accession in many libraries.

When the 'mechanics' of a citation index are explained to a potential user the initial reaction is usually very favourable. But there has been little opportunity so far to test this in practice and its use may prove more laborious and less valuable than appears at first sight. Use of a citation index implies that a relevant paper is known to start with, and if this is not the case some conventional index is required to trace one, in order to enter the citation index at all. Using this relevant paper as a 'starting' paper by which to enter the index, it will only reveal about two citing papers on average, with the variation here being very wide, some revealing none, others thirty or many more. If the starting paper gives no results at all any references in the bibliography of the paper itself may be examined and any relevant ones be used as starting papers. If a search needs extending to produce more papers the index may be re-entered by any of the relevant citing papers found or again any of their own references. Going up and down in this way is known as 'cycling', and although it can be carried out at great length it is a time-consuming process which will pull out a large number of papers, many of which may be of no interest.

Many of the claims made for citation indexes are not concerned with the citation index as a retrieval tool at all but concentrate on the additional information it gives, such as data for studies in patterns of scientific research, statistics of information publishing habits, etc. While such information is of value its potentiality as a retrieval tool will be of primary interest to users, and until some test of this is carried out its performance in this respect will not be known. There is no doubt that the citation index appears to be a useful tool and were it generally available it would be used as a complement to conventional indexes. Problems of use in practice, such as the large size owing to the amount of data and the lack of information given in each entry (a criticism of current examples only), may mean that it would not be a very popular tool. It would not perhaps be the one index a librarian would choose to have as some advertisements suggest. While not wishing to criticize the support for citation index work that is available in the United States (one wishes it were available on a similar scale for documentation activities in this country) it leads one to wonder whether the citation index would look so attractive if similar effort was being expended on conventional indexes.

The use of references to provide links between papers has also produced a technique known as *bibliographic coupling.* Two papers are said to be 'coupled' when they have one or more references in common, and groups of papers may be formed when each paper in the group has at least one reference in common with a given paper (called a 'test' paper). In Figure 2, papers 2, 3, 4 and 5 are all members of a bibliographic coupling group because they each share identical references with the test paper 1. The size of the group may be varied by demanding that each member should be linked by more than one reference, perhaps two, three or more. As paper 4 is linked by three references it is said to have a 'coupling strength' of three and papers 2, 3 and 5 a coupling strength of two.

All this is the work of one man, Dr M. M. Kessler of the Massachusetts Institute of Technology. He has processed articles and references from thirty-six volumes of *Physical Review* and tried several different methods of forming the bibliographic coupling groups. He says that this technique groups papers mechanically, without using words and language; that no expert reading or judgment is required (even the text need not be available); and that the grouping is not static but will change to reflect current usage and interests of the scientific community.[5] Kessler does not make any specific claim for the usefulness of the grouping but he offers it as a technique worthy of further investigation.

The main group-forming method he uses is to take each paper in a collection in turn and make it a test paper and record the resulting associated papers in that group at their different coupling strengths. Not all the papers in a collec-

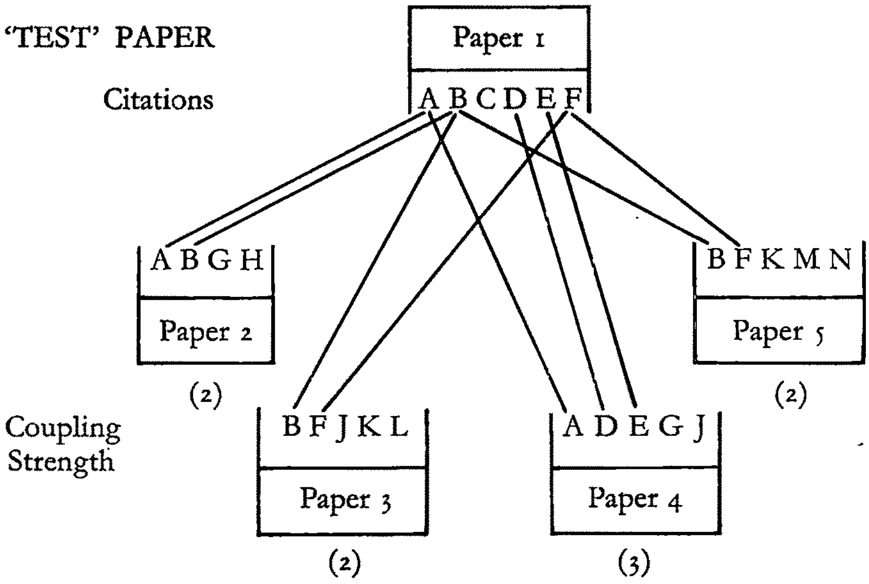

FIGURE 2. *A bibliographic coupling group*

tion will form any group at all as some will have no references in common with any other paper. Using a common collection of material Kessler has found that such groups are quite similar to those made by a conventional index the Analytic Subject Index to *Physical Review*.[6] He also shows that the use of different coupling strengths is a measure of the relatedness between papers, that as the coupling strength is increased so also does the probability that pairs of papers will be grouped together in a conventional index. Bibliographic coupling can be carried out on an ordinary citation index but the arrangement of a collection into groups makes it considerably easier to use in practice.

Some of the claims made for these new techniques of connecting documents imply that these methods can reveal papers relevant to a subject request that are not revealed by conventional indexes. If this means that conventional techniques just cannot provide connections to these relevant papers, however efficiently they are designed, then citation indexes may become most important retrieval tools. But this claim has not so far been tested to establish whether it is valid or not. Such a test is being carried out as a part of the present Aslib Cranfield Research Project and it is hoped that the results will provide some data to answer this question.

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THE DDC THESAURUS: PAST, PRESENT AND FUTURE

PAUL H. KLINGBIEL
Acting Chief, Lexicography Office, Defense Documentation Center, Alexandria, Virginia

Aslib Aeronautical and Chemical Groups Annual Conference, Cranfield, 9th–11th April 1964

INTRODUCTION

ALTHOUGH I am honoured to have been asked to present this paper I feel somewhat diffident about my topic. Even in the United States documentalists refer to thesauri in disparaging terms and I sometimes get the impression that British documentalists are sure that their American counterparts are suffering from an epidemic of thesaurosis. Interestingly enough, there really is such a disease, and the twentieth edition of Stedman's *Medical dictionary* defines the condition as follows: 'Abnormal or excessive storage in the body of phosphatides, fat, iron or other material'.

The uproar attending the publishing of our thesaurus is a little hard to understand in retrospect, particularly when one discovers that there are thesauri of proverbs, riddles, anatomy, antiquities, surgery, theology, humour, Jewish songs, quotations, slang, and on and on. In fact, the Library of Congress card file contains several inches of cards under the term thesaurus, and it appears that Roget was a latecomer to the field. The *Thesaurus dramaticus* appeared in London in 1724, published by T. Butler in two volumes. I am sure that the British Museum could furnish many more examples. This thought sufficiently encourages me to narrate the history of the thesaurus which I helped to create.

THE DDC THESAURUS: PAST, PRESENT AND FUTURE

The past

The fourth edition of the *ASTIA Subject Heading* list was published in January 1959. One month later a group met to consider the problem of devising a suitable vocabulary for use with a document retrieval system based on computer files. This was the first in a series of many such meetings. By July 1959 the conceptual basis for the new vocabulary had been worked out and construction was begun. The first printed version of the new vocabulary appeared in May 1960 as the *Thesaurus of ASTIA descriptors* (first edition).

Reaction was mixed. The *ASTIA subject headings* vocabulary had become an accepted standard and its passing was mourned by many. Some objected to the use of the word 'thesaurus'; others objected to the use of multi-word indexing terms, and finally there were statements of horrified disbelief that each descriptor had been assigned to one and only one group with the intent of restricting the use of each descriptor to the sense implied by the group designation.

These three points of contention correspond precisely to the points of innovation worked out by the vocabulary group in the spring of 1959.

The first ASTIA Thesaurus was the authority used to translate the subject heading assignment of all AD documents beginning with AD 1 (February 1953). Accessions subsequent to 1960 were indexed with the new vocabulary as they entered the system. As a matter of policy the original vocabulary was held almost constant during the translation process and for about eighteen months thereafter. Work on the second edition did not begin until more than 200,000 documents had been indexed and over 3,500 requests had been searched by computer (the number of machine searches was probably on the order of seven thousand because most requests require more than one search pattern). This indexing and retrieval experience was a large factor in the revision of the first edition.

The present

The *Thesaurus of ASTIA descriptors* (second edition) appeared in December 1962 and it may be taken as a fair appraisal of where we are today. Note that the word 'thesaurus' has been retained. We have similarly retained the Field and Group Structure and we still have multi-word indexing terms. A word on each of these facets may help explain our present position, illuminate the past and serve as an indicator for the future.

I do not intend to give a long, detailed defence of the use of the word 'thesaurus'. I must admit that the term has caught on and it is used today to describe almost any type of indexing vocabulary. Our choice in 1959 was deliberate and we had more in mind than the basic definition of 'a storehouse or treasury'.

The Group and Field Structure is an interface between the vocabulary of the user and that of the system. It is not itself a part of the vocabulary. Consequently it is not correct to dismiss Groups and Fields as merely generic classes[1] which could have or should have been included within the vocabulary. These Groups and Fields perform the same function as Roget's categories: their flavour is different. Categories such as Space, Time or Sensation do not appear. In their stead we have Detection, Defence, Abstract Concepts and disciplinary categories such as Mathematics or Aeronautics. The ASTIA Thesaurus bears the imprint of the need it serves.

There is another interface between the established vocabulary and the language of the user. This is the 'Use' reference. Every A in 'A use B' is a direct point of contact between the user and the system. Of course this link is not unique to descriptor vocabularies. Neither is it inconsiderable: several thousand such references exist in the second edition and I expect an even greater increase in future editions.

In summary the ASTIA Thesaurus is intended in part as a device whereby the user can easily move from an idea to an authorized indexing and retrieval term. The broad idea words are our Group and Field headings. Exhaustively listed within them are the authorized words which may be used to express those ideas. The Thesaurus has a network of associations displayed within the vocabulary but it was not this feature which led us to call our vocabulary listing a Thesaurus.

We have retained multi-term descriptors but we have not gone to seven- and eight-term descriptors[2] such as 'Camera for aerial photography of ocean waves' or 'Ground or base equipment, installation and technical procedures'. Our most specific terms are part of our so-called Identifier vocabulary. Of about six thousand coded, authorized Identifiers, 28 per cent have been used only once, a fact largely explained by the extreme specificity of the Identifier terminology. In contrast less than 5 per cent of our descriptor vocabulary has a use frequency of only 1.

A very large part of our current effort is involved in making the UNIVAC 1107 thin-film computer operational. The computer is destined to become an integral part of the vocabulary building process. The analyst will be permitted two types of entry: terms selected from the approved vocabulary and terms of his own choosing or as recommended by the writer of the report. Terms selected from the authorized vocabulary will be recognized and accepted by the computer as input data. New terms will be diverted to the Lexicography Office for study. Procedures are being set up so that we can react very quickly to new trends in the technical literature without setting up as authorized terminology mere terminological idiosyncrasies of some of the persons preparing reports. Correlations of this data with similar material from the bibliographic-request side of the house should put us in contact with the current and changing interests of the Department of Defense scientific community.

The future

About eight thousand copies of the second edition of the ASTIA Thesaurus have been distributed during the past fifteen months. Modification has been made on the basis of our own internal needs. We anticipate substantial further modifications to take care of the requirements of the Office of Technical Services as they begin to process the unclassified, unlimited government reports supported by the Department of Defense. Additional modification is taking place with the co-operation of the British Ministry of Aviation. These efforts are rapidly making the second edition obsolete and it is not too soon to begin to think in terms of a third edition. However, because of the increasing trend towards standardization, there is some pressure to merge our vocabulary with that of other government agencies in such a fashion as to evolve a National Thesaurus. I cannot predict at the moment whether there will be a third edition or whether the move toward a National Thesaurus will materialize. In any event, further revisions of the Field and Group Structure will occur. There are three internal considerations: (1) the utility of this structure as an interface between free language textual material and our authorized vocabulary; (2) the relationship of this structure to the thirty-three divisions into which our TAB Bulletin is partitioned, and (3) the problem of translating the Group and Field organization into appropriate categories for the Field of Interest Register, a device used to record the need-to-know status of our users.

External consideration may also affect the Group and Field arrangement, particularly if the recommendations of a recent study group[3] should be adopted. This group suggested the development of a common subsumption scheme such as that previously developed to subsume the indexing vocabularies of AEC, DDC, OTS and NASA. It is most probable that such a common classificatory scheme would be carried over to a National Thesaurus and replace the present DDC Groups and Fields.

The possibility of a National Thesaurus presents a considerable problem in vocabulary building because of the many roles which an individual technical term may take. This is such a large problem that I will not attempt to be specific. I would suggest, however, that there are two alternatives: one solution is to limit the proposed vocabulary to terms of a very general nature; the other solution is to try to develop a common vocabulary in depth. I have no doubt that the technical skills exist to develop a National Thesaurus of general terms. The application of such a thesaurus is another matter.

The successful implementation of a National Thesaurus of the second type would require a deeper investigation of the uses of scientific notions than has been required by individual agencies in the development of their own vocabularies. Some of these are discussed in a recent NSF report. I would like to add a word about the categorization problem.

When one grapheme represents several morphemes these different concepts should be separated and located in different groups as in the original ASTIA Thesaurus. Example: PLASMA; separate into GASEOUS PLASMA and BLOOD PLASMA. PLASMA STREAMING might require separation into PLASMA STREAMING (BIOLOGICAL) and PLASMA STREAMING (PHYSICS). In contrast the 1963 edition of *Medical subject headings*[4] lists SILVER NITRATE in three groups: (1) inorganic chemicals, elements, simple compounds and related terms; (2) pesticidal, anti-infective and anti-neoplastic drugs; and (3) chemicals and drugs, miscellaneous. However, this is a case of a material and its application, not a case of a single grapheme representing two or more morphemes. If SILVER NITRATE is given a unique code definition then the use of that code determines the intent of the term in a given index set. If no code is involved a certain ambiguity of use and intent is present unless explicit indexing rules are imposed which state that the indexing set must contain not only the material but also its application. Thus (SILVER NITRATE and DRUGS) or (SILVER NITRATE and PESTICIDES) or something similar must be used.

Another example from the same source is the term TONSILLITIS. It appears in four groups: (1) infectious diseases; (2) digestive system diseases; (3) respiratory diseases; and (4) hemic and lympathic diseases. The relationship expressed in this case is generic in the sense that TONSILLITIS is a member of the class of infectious diseases. Here, too, if the Group or Category is to function as more than a vocabulary locator (a use which I am by no means denigrating), then special indexing rules must apply. Whereas SILVER NITRATE, when not linked with another term, could unambiguously represent this material simply as an Inorganic Chemical, it would appear that TONSILLITIS could never appear alone but would always require linkage with another notion.

A National Thesaurus of any real depth would surely be a multi-volume compendium. As such it could not function as an effective indexing or search tool for anyone. A National Thesaurus, therefore, must be thought of as an authoritative reference from which selected subsets, in the form of agency (specialized subject area thesauri), would be drawn, uniquely tailored to the document collection it is to serve, yet compatible with all other microthesauri since all would draw from the same source.

I believe that the state-of-the-art has reached a point where the development of a vocabulary *qua* vocabulary is reducible to a systematic procedure. What requires exploration is the *use* of a vocabulary once it is built. ASTIA attempted to build indexing rules into its first Thesaurus. I am pessimistic of the chances of accomplishing this in either a third edition or a National Thesaurus. A high degree of conformity can be achieved by setting up a small group of reviewers through whom everything must pass. That which does not conform to the idiosyncrasy of the group is to be omitted or changed. Such a solution may satisfy any given documentation centre but vocabulary inter-Agency compatibility is then an illusion.

My concern is with the reproducibility of the indexing process, measured in terms of the reproducibility of the index set. Unless such reproducibility is maintained retrievability is as much a function of the indexer as it is of the search strategy. A National Thesaurus, in and of itself, is not enough. To be meaningful such a vocabulary must be accompanied by prescriptive indexing rules.

You are well aware that indexing and retrieval are opposite sides of the coin since 60 per cent of the failures in recall in the Cranfield Project were traced to inadequacies of indexing. I shall watch with interest the development of your new project on the testing of index language devices.

A word about retrieval at DDC. It is quite possible to co-ordinate two terms and get five thousand hits: changing one of these terms may easily result in no hits at all. Quite apart from the problem of relevance it is natural to look for means of forecasting the results of a search before it is made.

A simple frequency count provides the searcher with an upper bound to the number of hits for any two-term search. A more sophisticated device is a context set which lists for each descriptor the frequency of co-occurrence with all other descriptors. Such context sets provide a very close check on any two-term co-ordination but provide no information about higher order co-ordination except to prevent searches which will end in blank sorts. Context sets can be further sophisticated by using statistical techniques to determine the degree with which terms in the same set are significantly associated.

Frequency counts have revealed that a surprisingly large portion of the indexing vocabulary is seldom used. When computer running time costs as much as $600 an hour it may be expedient to prepare a listing of low-frequency terms for manual search.

I suspect that the freedom to index provided by the new system will generate terms of very low frequency 90 per cent of the time. Nevertheless the experiment is a very worth-while one. First of all it will take the matter out of the realm of speculation, and even if the 90 per cent prediction is correct the value of the other 10 per cent could be extremely high. Terms of low frequency, if representative of careful indexing, should provide excellent relevance and recall ratios. However, as the number of low frequency terms increases, the vocabulary grows to a point where the very specificity may act to disperse rather than to collect. Cross-referencing alleviates this to some extent. Yet even a well cross-referenced vocabulary of fifty thousand terms could present severe retrieval problems. We are storing hierarchical relationships between descriptors in the computer. Specific or generic searches are thus possible with equal facility. If this device is effective we may attempt other kinds of computer cross-referencing.

Finally, it should be emphasized that DDC is a service agency. We have a growing document collection which at this moment is of the order of 350,000. Requests for bibliographies are running close to ten thousand per calendar year. Improvements in such a system must be evolutionary rather than revolutionary. Difficult searches are symptomatic of problem areas and the insight gained by studying such searches should be used to modify our search tapes, our vocabulary and our indexing techniques. We gladly solicit interest, advice and support in the continuing effort to improve our service.

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THE NATIONAL REFERRAL CENTER: SCIENCE AND TECHNOLOGY IN THE LIBRARY OF CONGRESS

M. W. MCFARLAND
Library of Congress

Aslib Aeronautical and Chemical Groups Annual Conference, Cranfield, 9th–11th April 1964

EIGHTY years ago, in his famous book *Life on the Mississippi*, Mark Twain wrote a few lines which may help us keep perspective on the problems that this conference has been considering. He said:

'In the space of one hundred and seventy-six years the Lower Mississippi has shortened itself two hundred and forty-two miles. That is an average of a trifle over one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the old . . . Silurian Period . . . the Lower Mississippi River was upwards of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing-rod. And by the same token any person can see that seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three quarters long, and Cairo and New Orleans will have joined their streets together. . . . There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact. . . .'

So it appears to be with scientific and technical information today, for the proportion of conjecture to fact remains about as Mark Twain found it. Of course, Cyril Cleverdon and his valiant, if conscripted, colleagues are doing a great deal to reduce the fog but in this business one fog is scarcely cleared away when another, possibly denser, fog rolls in to take its place.

What *is* the role of the Library of Congress in scientific and technical information? It is a large and complex role with a long history. To a greater or lesser degree the Library has been in the business since it first opened its doors nearly 164 years ago under the approving eye of the philosopher-president, Thomas Jefferson. It got pointedly into the collection of scientific literature as a result, actually, of the barbaric behaviour of some British troops who happened to be in Washington in 1814 and set fire to the Capitol building where the infant Library of Congress was housed. What with fire, smoke and water the book collections were a total loss. Thomas Jefferson, an ardent bibliophile, then living retired on his estate of Monticello in Virginia, felt the loss more keenly perhaps than the Congress did and offered his own distinguished private library, containing several hundred works of natural history and philosophy, as the embryo from which a new and more splendid library for Congress could be developed. The offer was accepted; actually Congress bought the Jefferson library of some nine thousand volumes for a rather tidy figure.

The next great leap forward came in 1866—again as a result of a fire—when the Library of Congress took over the great scientific library of the Smithsonian Institution, a library especially strong in the journal literature of scientific academies and other learned bodies all over the world. The modern—or is it post-modern?—period began about sixteen years ago, shortly after the Second World War, when the first predecessor of today's Defense Documentation Center was formed within the Library of Congress. About two years later there was established a Science Division—since renamed the Science and Technology Division—to manage and relate the Library's internal operations with the growing volume of bibliographic work being done by the Library on contract for other agencies and institutions.

The stake of the Library of Congress in scientific and technical information and the sci-tech community's stake in the Library are represented first its great collections of books, periodicals, and technical reports, and of manuscripts and films as well. The Library is not merely a treasure house, as some critics like to refer, left-handedly, to libraries in general; it is not so much like Fort Knox as it is like the Bank of America: it is a working treasury, not dead storage or a miser's hoard. As of 1963 the capital consisted of more than two million books in all sci-tech fields; some twenty thousand current sci-tech journal and other serial titles (not issues) received each year; a collection of several hundred thousand technical reports, with more than fifty thousand being added annually. In addition there were thousands of photographs and films (still and motion) of manuscripts, pamphlets, and other materials.

Where does all this come from? From purchase, gift and exchange (we have several hundred exchange agreements with the Soviet Union alone), copyright and other forms of deposit.

Who uses it? Practically everybody, directly or indirectly.

We must remember that the Library of Congress *is* the Library *of Congress*: it is not, legally or actually, the national library of the United States. Also, it is a part of the Legislative, as distinct from the Executive, branch of the Government; that is, it does not report to the President, as do the State Department, the Defense Department, and most of the other agencies with which you may be familiar. It reports, instead, in so far as it reports at all, to the Joint Committee on the Library, a joint committee of the House and Senate. And for an agency of three thousand souls it has a very modest budget—slightly over $25,000,000 last year.

Who in the Library is responsible for sci-tech information, and what types of jobs do we do? There are four divisions—all of them part of the Reference

Department, the largest of the Library's six departments—concerned almost exclusively with science and technology: first, there is the Science and Technology Division *per se*, of which Dr Dwight E. Gray, a physicist, late of the National Science Foundation, is Chief, and of which I am the Assistant Chief; second, the National Referral Center for Science and Technology, of which I shall speak in detail later; third, the Aerospace Technology Division; and, fourth, the Defense Research Division. The last two, ATD and DRD, are what are called 'project' divisions—supported by Air Force or Department of Defense funds and perform tasks assigned to them by the sponsoring agencies. DRD is a classified Defense operation and will not concern us. ATD, run by George Pughe, is probably well known to at least some of you. It is concerned with the foreign technology problem and gives a variety of literature services on Soviet and Chinese bloc science and technology matters. It is a big operation and has an annual budget in seven figures.

These four divisions are not the only ones in the Library concerned in one way or another with sci-tech information. The Photoduplication Service—which is again a big operation—does from 80 to 85 per cent of its business in sci-tech literature. The General Reference and Bibliography Division has an International Organizations Section, supported by National Science Foundation funds, which compiles and publishes information about international organizations and international meetings, a high proportion of which organizations and meetings relate directly or indirectly to science and technology. The Legislative Reference Service—that part of the Library which is devoted exclusively to serving the needs of Congress—has a high-level specialist in science and technology and several specialists in related fields, including engineering and economics, natural resources and public works.

The Science and Technology Division's directive says that it has primary responsibility within the Library of Congress for all reference and bibliographic services in all fields of science and technology, and has custodial as well as service responsibility for the technical report collections. We do no cataloguing and no indexing except in connection with the large special bibliographic projects that we do under contract. We are, by the way, one of the twelve Federal Regional Technical Report Centers established a year or two ago by the Office of Technical Services of the Department of Commerce under the sponsorship of the Office of Science Information Service of the National Science Foundation. Of course the Library was and would be in the technical report business without this development which, from our standpoint, largely serves to increase the rate at which reports are deposited in the Library.

In effect, then, the Science and Technology Division's directive means that it:

1. Has acquisition-recommending responsibility for all of the Library's science and technology collections—though we do no technical processing, we *are* responsible for their development, currency and completeness.

2. Provides reference and bibliographic services on these collections to the Congress, to the scientific community, to other Government agencies and to the general public.

3. Carries on a number of special bibliographic projects under contract or transfer-of-funds arrangements with other Government agencies.

4. Prepares and issues a number of publications, including special bibliographies and documents designed to bring under bibliographic control some particular segment of the Library's science and technology collections.

Figure 1 shows the functions and organization of the Science and Technology Division. At the top we have the usual managerial staff—the Chief, the Assistant Chief, and the Administrative Office. At the left we have a box representing the Specialist Staff, which includes a scientist specializing in the physical sciences, another scientist specializing in the biological sciences, and an engineer representing the engineering sciences. These three top-level people work almost exclusively for the Congress, either directly or through co-operation with the Legislative Reference Service. They have a professional library assistant and a typist-stenographer but in case of need are free to call upon the Reference and Library Services Section (represented by the box above it) or, indeed, if necessary, upon the entire staff of the Division.

The Reference and Library Services Section is the part of the Division which would be there if none of the other parts was. It does the usual—and the unusual—sorts of reference services, handles all the reference inquiries from the Congress as well as from the public, except those inquiries from Congress which require the preparation of high-level studies, reports, or publications. This section handles the inquiries referred to the Science and Technology Division by the Referral Center. It also operates a paid literature searching service which is available to industrial concerns, principally, or other segments of the public; this paid service is a co-operative effort between our Division and the Office of Technical Services of the Department of Commerce—under the law they can take money from the taxpayer's pocket directly; we can take only indirectly, through transfers of funds from other Government agencies. Last, but not least, the Reference and Library Services Section operates the Science Reading Room—a special feature of which is a very large collection of the world's abstracting and indexing services—and the Technical Report Center. I should say that one of the principal services performed by the Library Services part of this large section is provision of actual physical access to periodical and report literature on a day-to-day basis to the Division's various bibliographic projects. This unit sees to it that all the so-called 'core list' journals needed by each project are brought to the abstractors as soon as possible after their receipt in the Library; the journals are scanned by the abstractors, who earmark the articles selected for abstracting; these articles are then microfilmed on our own camera; within twenty-four hours the film is processed by the Photoduplication Service and Xerox copies, in whatever quantity we need, are returned to the abstractors for abstracting; meanwhile the actual copy of the journal has been released by the Division and returned to shelf or wherever it is to be routed. This rapid-access service is new in this form and by the end of the year we hope to be scanning on an up-to-the-minute basis between three thousand and five thousand journal titles required across the board subject-wise by our bibliographic operations. We think that this service will greatly improve our abstracting work in terms of promptness and thoroughness of coverage.

On the right side of Figure 1 there are four boxes showing our large bibliographic projects, which for simplicity and directness of administration have been given status as sections. The top one of the row of three is the Aerospace Medicine and Biology Bibliography Section, which prepares the bibliography for NASA and for the Air Force. The next one down is the Cold Regions Bibliography Section, which prepares two continuing comprehensive bibliographies: the first, the Snow, Ice, and Permafrost Bibliography, is now in its fifteenth year and its eighteenth volume and is done for the US Army; the other is the new Antarctic Bibliography, just completing its first year and about to get out its first volume, and it is paid for by the National Science Foundation's Office of Antarctic Programs. The third one down is the Radioisotopes Bibliography Section, which prepares a highly specialized bibliography for the Atomic Energy Commission on industrial applications of radioisotopes in foreign countries (from which stigma we somehow exclude Great Britain but not Australia!). The search problem here is extremely tough and we are very proud of this rather small but exquisite, if one may use such a word, bibliography. Coming to the last box on the extreme right, we call this, for lack of a better name, the Special Bibliographies Section. It compiles some dozen or fifteen bibliographies, most of which are not so broad in scope as the ones we have been considering, some of which are classified in nature, and many of which are done for the Department of Defense.

I should like to say a final word about the Science and Technology Division before we turn to the *pièce de résistance*, the National Referral Center. The staff of the Division numbers seventy-five people, a little over half of them professionals; the rest are administrative and clerical. We have ten Ph.D.s in various scientific disciplines. Collectively the staff hold forty-five B.A. or B.S. degrees and twenty-three M.A. or M.S. degrees. We are competent in more than twenty-five languages. In the whole division there are, at the moment, I think, only six trained librarians. This may seem odd to you but there are two main reasons. First, librarians with the sort of scientific training that our work demands are very hard to find; with effort and the right sort of human material to work with we can train a scientific person to do the library side of the job; we cannot hope to train a librarian to become a scientist. Second, the Library of Congress is not a part of the Civil Service; of its volition, it operates as if it were but it does not have to hire persons listed in the Civil Service register and in fact seldom does. In effect this means that, without elaborate circumlocution, we can fill what are essentially librarian-type jobs with non-librarian-type people—and vice versa if the need should arise.

The Division does jobs that one might not think of from the chart we have seen. From time to time, for instance, we undertake research studies of various kinds. Not long ago we completed the first phase of what was called a worldwide census of scientific and technical serial publications. With a grant from NSF we looked into the serials phase of the so-called information explosion and found by actual count that the world population of science serials is a lot closer to thirty-five thousand titles than the figure 'in excess of fifty thousand

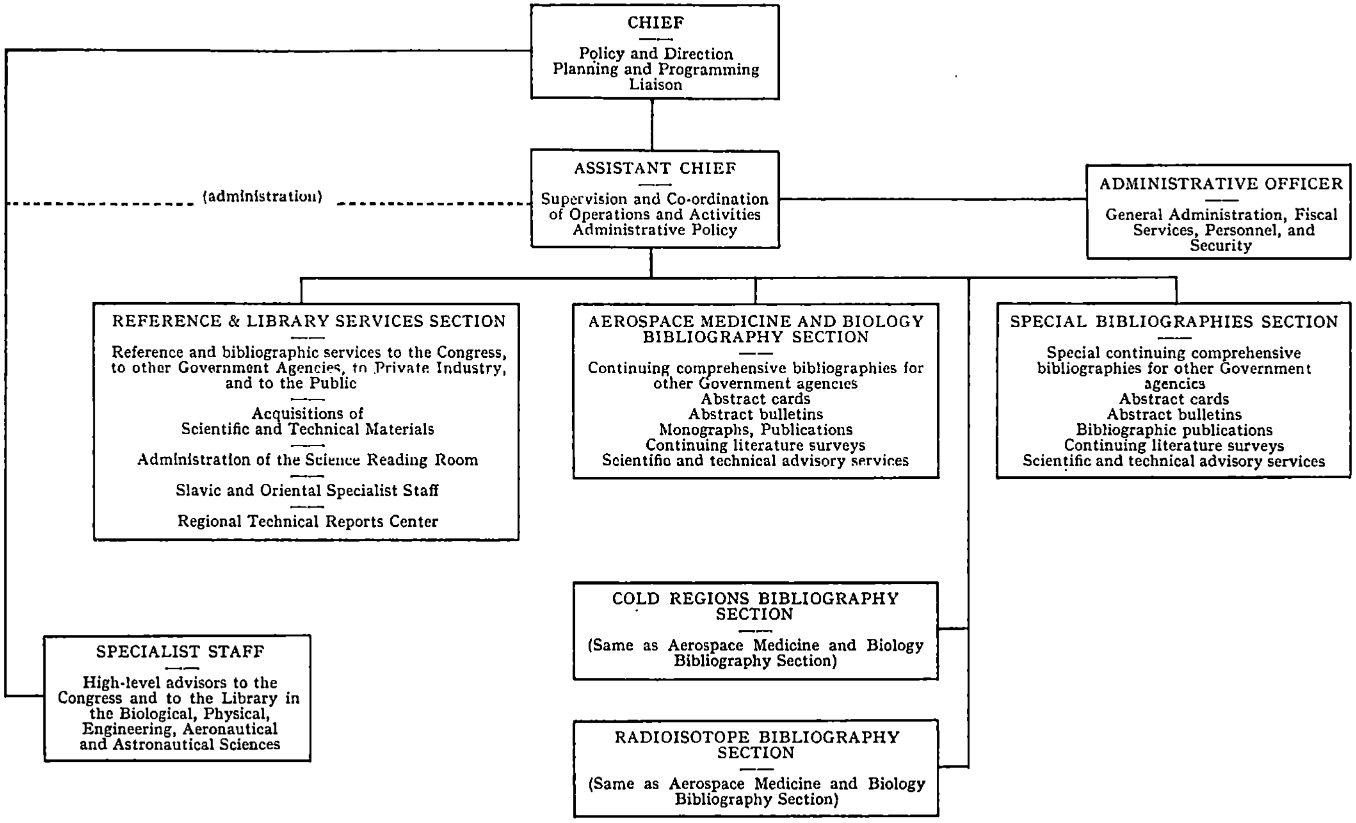
CHIEF
Policy and Direction
Planning and Programming
Liaison
ASSISTANT CHIEF
Supervision and Co-ordination of Operations and Activities
Administrative Policy
(administration)
ADMINISTRATIVE OFFICER
General Administration, Fiscal Services, Personnel, and Security
REFERENCE & LIBRARY SERVICES SECTION
Reference and bibliographic services to the Congress, to other Government Agencies, to Private Industry, and to the Public
Acquisitions of Scientific and Technical Materials
Administration of the Science Reading Room
Slavic and Oriental Specialist Staff
Regional Technical Reports Center
AEROSPACE MEDICINE AND BIOLOGY BIBLIOGRAPHY SECTION
Continuing comprehensive bibliographies for other Government agencies
Abstract cards
Abstract bulletins
Monographs, Publications
Continuing literature surveys
Scientific and technical advisory services
SPECIAL BIBLIOGRAPHIES SECTION
Special continuing comprehensive bibliographies for other Government agencies
Abstract cards
Abstract bulletins
Bibliographic publications
Continuing literature surveys
Scientific and technical advisory services
COLD REGIONS BIBLIOGRAPHY SECTION
(Same as Aerospace Medicine and Biology Bibliography Section)
RADIOISOTOPE BIBLIOGRAPHY SECTION
(Same as Aerospace Medicine and Biology Bibliography Section)
SPECIALIST STAFF
High-level advisors to the Congress and to the Library in the Biological, Physical, Engineering, Aeronautical and Astronautical Sciences

FIGURE I

and still rising' that one so often encounters. We are now continuing this study, which has several possible stages yet to pass through. For a start we hope to analyse the fourth edition of the *World list of scientific periodicals,* of which Butterworths were kind enough to let us have advance proof sheets.

We now come to our brother Division, the National Referral Center for Science and Technology, which is well known through the Weinberg Report and articles in library journals and is an enormously interesting undertaking.[1] Since it came into being we have found that national referral centres, national referral data centres and national data referrals centres are coming very much into vogue, so much so that our data and our referrals will soon be more nationalized than might have been conceived by the Soviets and VINITI.

The National Referral Center for Science and Technology was established formally eighteen months ago and went into operation on 1st March 1963. It is supported at the present time by funds transferred to the Library of Congress by the National Science Foundation. The Center operates under general directives from the National Science Foundation but is administered and operated entirely by the Library of Congress in which it is a division of the Reference Department.

The National Referral Center was designed as 'a clearing house to provide comprehensive, co-ordinated access to the nation's resources of scientific and technical information', and it was given four major areas of responsibility: (1) the identification of all significant information resources in the fields of science and technology; (2) the acquisition, cataloguing and correlation of substantive and procedural data defining the nature, scope, and capabilities of these resources; (3) the provision of advice and guidance about these resources to any organization or individual requiring access to them by responding to requests for referral assistance and by publishing directories and guides in selected subject fields; and (4) the exploration, through actual operating experience, of the roles and relationships that exist or should exist among the many elements of the scientific and technical information complex.

The first task given the Center is to identify and the second to catalogue—list, describe, inventory—all significant scientific and technical information *resources.* A major problem has been to convey to the organizations and institutions that have been solicited to provide input to the inventory just what is meant by the term 'information resource'. To be meaningful within the referral clearinghouse concept that underlies the Center, the definition must be highly flexible and go beyond the obvious, the conventional, and the merely formal. The Center's purpose is not to duplicate what libraries and information centres are already doing and are organized and equipped to do; it hopes to go beyond that both in variety and specificity—to make ever more precise linkages between the user and the place where the highly specialized information that the user requires is to be found. Therefore an information resource may be any organization, facility, or individual willing and able to give authoritative responses to scientific and technical inquiries out of an existing—but perhaps little known, or known but not discovered—store of knowledge or expertise. In order to get precise definitions or descriptions from all elements that are to go into the inventory of information resources, the Center uses a questionnaire which the resource, or the people at the resource, fill out, hopefully in the fullest possible detail. The inventorying process thus seeks to discover what sort of information an information resource deals with, how it deals with it, how its information may be obtained, or used, or gotten access to, by anyone needing that information, and to learn how much it costs, if it costs anything, and so on. The inventorying process then analyses in depth, in terms of the response to the questionnaire, each information resource and establishes for the file, and therefore for the user, the most comprehensive and accurate profile that can be achieved.

When the Referral Center in its early days sent out its questionnaire there was an understandably large amount of misunderstanding of its purpose. After all, it was something new, and all new things tend to be looked upon with doubt, if not suspicion. Reports from professional societies, for example, would come back stating the titles of publications issued but giving no statement of the information services, if any, the society was able and willing to provide to inquirers who might ask questions, possibly as a result of using the society's publications. Universities would write back listing their libraries and library collections but omitting all mention of research groups, experiment stations, institutes, and the like, which were associated with or a part of the university. By painstaking correspondence, telephone conversations, or personal visits with the information resource under consideration, the Referral Center has been able to iron out many of these initial difficulties.

The second major problem was in making clear to information resources being brought into the system and to users that the Referral Center *refers*, that it tells inquirers where to apply to obtain the information that is needed; it does not itself supply the substantive or bibliographic information. The function of the Center is *not* that of a reference service—it does not meet requests for assistance by citing a specific publication or by preparing a list of bibliographic sources.

As there are exceptions to every rule, there is one exception to this: the Referral Center in its replies to requesters *does* cite abstracting and indexing services, which it regards as essentially indistinguishable from the producers of such services and therefore legitimate 'referral points' by Referral Center definition. Other regular publications are of interest to the Center only to the extent of their titles, which may be quoted in connection with referral to the issuing agency, in case the requester indicates a desire to become a subscriber or to apply to be put on a free mailing list.

How does the National Referral Center for Science and Technology actually work, and what progress has it made in its first year of operation? Figure 2 shows the Center's very simple structure. At the top we see that it comes under the Library of Congress and, more immediately, under the Reference Department. At the top on the other side we record the sponsorship of the National Science Foundation. The large block in the centre of the chart represents the National Referral Center itself, with its main office (the Center Office), under the Chief, John F. Stearns. Below, on the left and the right, there are two sections. The left side might be called the input side of the Center's work, with the Systems Identification and Analysis Section, composed of a group of science analysts—people with scientific degrees and working experience in science—and of the storage and retrieval system. In this Section a basic record for each information resource is established in a standardized format to allow the coherent recording of the numerous and extremely varied elements of descriptive and subject cataloguing necessary to satisfy the complexity of retrieval demands. These elements are entered in a peek-a-boo system using a vocabulary developed from the Center's analysis of the returns it has received from its carefully constructed and frequently revised and updated questionnaire. This vocabulary and retrieval method is highly sensitive to the specialized terminology which an information resource uses in thinking of itself and describing its own activities and services. It may be imagined that the task of achieving anything like precision in defining what an information resource really does is one of great difficulty and represents a problem that perhaps cannot be solved in terms that would be widely acceptable and universally understandable unless and until a common operational language is evolved for the whole scientific and technical information effort.

At the right we have indicated the output side of the Center's work, carried out by the Referral Services Section, which includes a group of referral specialists—who are essentially information people—and a directory and publications group. The referral specialists handle inquiries on a day-to-day basis, and the directory and publications group carry out longer range tasks, such as the preparation, now well under way, of a three-volume listing of major scientific information activities. Two volumes, one covering the physical and the other the biological sciences, are being prepared by the National Referral Center staff; the third volume is to be the product of a survey of social sciences information resources which is being conducted by the Bureau of Applied Social Research at Columbia University. Other directories and guides will be issued from time to time.

The Referral Center at present has a staff of thirty-one persons, 50 per cent of whom are professionals. In its first year of operation it received and answered 1,400 inquiries. It is now getting forty to fifty requests per week. I think it is a most interesting and significant fact that 19.6 per cent of the inquiries come from librarians and that 36 per cent of the Center's replies to inquiries cite public or special libraries as the appropriate referral point for the inquirer to go to. This figure does not include referrals made to other Divisions of the Library of Congress and to other Government agencies, such as NASA, OTS, and so on.

Who uses the service? Fifty-one per cent of the inquiries have come from commercial organizations; 18 per cent from Government agencies, including libraries; 8 per cent from educational institutions; 5 per cent from professional societies, technical and trade organizations; and 18 per cent from individuals whose business or professional affiliation was not disclosed by the inquiry. Two leading commercial firms have given the National Referral Center a standard routine of their information searching procedures. Seventeen per cent of the inquiries have dealt with the physical sciences; 17 per cent with the biological sciences; 38 per cent with engineering; and 28 per cent with the social and behavioural sciences.

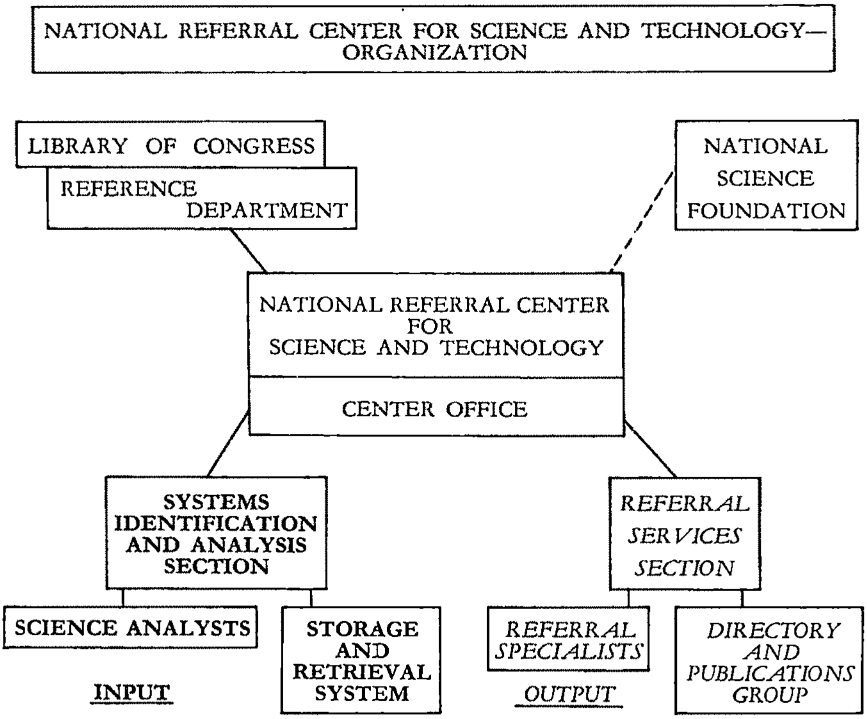
NATIONAL REFERRAL CENTER FOR SCIENCE AND TECHNOLOGY—ORGANIZATION
LIBRARY OF CONGRESS
REFERENCE DEPARTMENT
NATIONAL SCIENCE FOUNDATION
NATIONAL REFERRAL CENTER FOR SCIENCE AND TECHNOLOGY
CENTER OFFICE
SYSTEMS IDENTIFICATION AND ANALYSIS SECTION
REFERRAL SERVICES SECTION
SCIENCE ANALYSTS
STORAGE AND RETRIEVAL SYSTEM
REFERRAL SPECIALISTS
DIRECTORY AND PUBLICATIONS GROUP
INPUT
OUTPUT

FIGURE 2

The present size of the system is not great but it is rapidly growing. There are at present 9,500 known or potential information resources—places where information may be obtained. Six thousand of these have been solicited to allow their profiles to be put into the system. Replies from 3,800 have been received and profiles written, at least in draft form. Two thousand completed and approved profiles are actually in the system. The rate of increase in the store is 100 to 150 items per week. You must remember that virtually all of these information resources are local to the United States; in a very few instances foreign information resources have volunteered to be included in the system and, for the present and foreseeable future, only volunteers from overseas will be put in.

The National Referral Center is naturally very vitally concerned with feedback. Two months after its initial reply to an inquiry, it again writes to the inquirer asking what result was obtained from the various referral points cited and if the answer was satisfactory. The response to these follow-up letters has been 56 per cent. Eight per cent of the replies say: 'You didn't help us a bit. Drop dead'; 18 per cent say: 'Thanks but it didn't really work out'; 74 per cent report unqualified satisfaction.

The question that is most frequently asked about the National Referral Center is: 'What, precisely, are you up to? What are you really trying to do?'

It is frustrating to be asked this over and over because there is no easy, ready answer, beyond the obvious one that the Center is trying to improve the exchange of scientific and technical information. Anyone can use the Center. Its services are free. Any Aslibian can use it for information concerning the United States and you are all invited and encouraged to do so. We feel that there is absolutely no conflict at all between what the Center does and what libraries do. Any good librarian does, on as broad a scale as an individual can, just what the Referral Center does. Libraries and librarians have always made referrals. The difference in the case of the National Referral lies in its scope, the depth to which referral points are analysed, and the fact that the whole thing is reduced to system.

The National Referral Center's great hope is that other countries will follow suit and establish referral centres of their own. If country after country would do so an international network of referral centres could be developed, and the scientist, the engineer, and the technical librarian would have easy, rapid access to scientific and technical information everywhere. If there is to be such a development, librarians will have to raise their sights and lead the way. Certainly librarians must be concerned and look to their laurels when they read what Mr Hanson said at St Andrews last September:

'To put it crudely: library services are accepted as a means of meeting simple needs, which are many. They are not accepted as an obvious source of help with difficult problems. In neither case is it generally true that the job of finding information is entrusted to the library staff, although engineers as a group do seek their assistance more often than they do the job themselves. Libraries and information services, although set up for the specific purpose of collecting and providing information, are not regarded by scientists as key sources of information except for limited purposes. And their staffs, although specialists in information handling, are not entrusted with much of the work.'[2]

The National Referral Center is an attempt to meet this very criticism. It is not *the answer* to the problem—there never can be any one answer to it. But it is a step in the right direction. The fact that it is in a library, and emphasizes libraries as key sources of information wherever it is appropriate to do so, we feel, cannot help but improve the 'image' of libraries and librarianship.

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MEMBERS' ADVERTISEMENTS

The charge for advertisements in these columns is 4*d* per word, minimum 5*s*. An additional charge of 6*d* is made for the use of a box number.

ABILITY AND SERVICE. Technical or commercial translations into/from Dutch and German. Speller-Kuijpers, FIL, NGV, 6 Lakeside, Ealing, London W13. ALPerton 1045.

WILFRED E. GOODAY, ARSM, DIC, MIMM, FIL. Member of Translators' Guild. Rumanian and French. 161 Rivermead Court, London SW6. RENown 1912.

TRANSLATIONS FROM TURKISH. All subjects. F. P. Scott, 4 Uphill Grove, Mill Hill, London NW7.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. STAmford Hill 8564.

GUARANTEED TRANSLATIONS (pharmaceutical, medical, etc.) from and into Spanish, French, German. G. Sceats, 194 Cooden Drive, Bexhill-on-Sea.

Appointments vacant

BRITISH INDUSTRIAL PLASTICS LTD (a member of the Turner & Newall Group). B.I.P. CHEMICALS LTD have a vacancy for a TECHNICAL INFORMATION OFFICER in their Technical Department at Oldbury. The work is concerned with the writing of technical literature for publication and also the preparation of reviews for internal circulation. It will also involve assisting in the compilation of the Library News Bulletin and development of the Keydex information retrieval system which has recently been introduced.

A knowledge of scientific German, French or Russian would be useful but the main requirement is an ability to write fluently in English.

The company offers excellent conditions of employment including a contributory Pension and Life Assurance Scheme. Applications should be made in writing giving full details of qualifications to the Personnel Manager, B.I.P. Chemicals Ltd, Popes Lane, Oldbury, Birmingham.

ASSISTANT LIBRARIAN required at the National Coal Board's Mining Research Establishment, Worton Hall, Isleworth, Middlesex. Applicants should preferably be Associates of the Library Association; technical library experience would be an advantage. Five-day week. Appointment superannuable and salary according to qualifications and experience, within the scale of £850–£1,010. Write for application form to the Personnel Officer at the above address.

ABSTRACTOR (woman graduate) required to assist in the preparation of material for two abstracting journals covering printing and packaging technology. Qualifications in science and/or languages would be an advantage. Applications to the Secretary, Printing, Packaging and Allied Trades Research Association, PATRA House, Randalls Road, Leatherhead, Surrey.

RESEARCH ASSISTANT required for the Aslib Cranfield Project on indexing systems, to work either in London or Cranfield. Particularly suitable either for young qualified librarian or for person having interest in information work with knowledge of statistics. Salary in range £800–£1,150 depending on experience. Applications to C.W.Cleverdon, Aslib.

INFORMATION WORK in food science and technology. Assistant wanted for abstracting and inquiries in research laboratory library. Minimum qualification 'A' Level chemistry, but experience of this type of work not essential. Assistance given for further study. Apply in writing to Joint Chief Chemists, United Dairies Ltd., Central Laboratory, Wood Lane, London W12.

ASLIB LIBRARY. There is a vacancy for a typist–clerical assistant in Aslib Library. Salary range £599–£713. Apply in handwriting to the Librarian, Aslib, 2 Belgrave Square, London SW1.

Wanted

Library Association Record 1930–1950. Good price paid. William Dawson & Sons Ltd, 16 West Street, Farnham, Surrey.

For sale

FOR DISPOSAL. Unbound volumes, some incomplete, of *Chemical Abstracts*, vol.30–57, 1936–1962 (missing vol.40, 1946). Any offers to The Librarian, Distillers Co. Ltd, Great Burgh, Epsom, Surrey.

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Aslib Proceedings

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Aslib Proc. vol.16 no.9 p.273-297 London, September 1964

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ASLIB PROCEEDINGS

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Volume 16 September 1964 Number 9

ASLIB CALENDAR 1964

September

MON.28 – THUR.1 October. 38th Annual Conference at University of Exeter. See paragraph below.

October

MON.5 – FRI.9. Course on abstracting and co-ordinate indexing. See paragraph below.

THUR.8. Technical Translation Group meeting at Aslib, 4 p.m. 'Soviet information services.'

THUR.15. Repeat of advanced course on patents—the new European patent system.

THUR.22. Evening meeting at Aslib, 5 for 5.30 p.m. 'What is classification?', by J. R. Sharp. See paragraph below.

TUES.27 – FRI.30. Junior introductory course to special library and information work.

November

FRI.6. Aeronautical Group Winter meeting at TIL and Royal Aeronautical Society, and sherry party.

TUE.10. Aslib fortieth anniversary reception. See paragraph below.

FRI.13. Technical Translation Group sherry party.

FRI.13 – SAT.14. Scottish Branch information course. See paragraph below.

MON.16 – FRI.20. Senior introductory course to special library and information work. See paragraph below.

THUR.26. Evening meeting at Aslib, 5 for 5.30 p.m. 'Dissemination of published information to executives . . .', by R. Hindson.

December

WED.2. Engineering Group meeting at Richard Costain Ltd, 5.15 for 6 p.m. 'Tunnels, tubes and the channel', by C. A. Pequignot.

MON.7 – THUR.11. Repeat of course on abstracting and co-ordinate indexing.

WED.23. Aslib Christmas sherry party. Admission by ticket.

Retirement of Mr George H. Davison

Aslib Council have received with regret the resignation of Mr George H. Davison on his retirement from The United Steel Companies Ltd in June 1964. Mr Davison is well known to members for his indefatigable services to information work in general, and in particular to the Aslib Northern Branch, of which he has been an officer since its inauguration and in recent years its Chairman. His professional writing has been prolific. He has served on several Aslib committees, and on Council since 1959.

For many years Mr Davison was an outstanding member of the Aslib Patents Sub-Committee. The insistent pressure which he brought to bear on the Patent Office resulted in the long-needed acceleration of its printing programme. We wish him every happiness in his retirement.

Aslib Groups

A cordial invitation is issued to all members who have not already joined a group, to take part in the activities of the special subject groups of Aslib. These are performing a very useful and lively service. There are eleven groups: Aeronautical, Biological, Chemical, Economics, Electronics, Engineering, Film Libraries, Fuel and Power, Furniture, Technical Translation, and Textiles. (The Fuel and Power has been able to do little during the past year because of lack of support.) Members who are interested in joining a group are invited to get in touch with the Liaison Officer at Aslib Headquarters.

Aslib Evening Meeting

At the first evening meeting of the winter Mr J. R. Sharp, F.L.A., Deputy Librarian and Information Officer of British Nylon Spinners Ltd, Pontypool, will give a paper called 'What is classification?' No aspect of librarianship has in the past caused more controversy than classification, and it still provides an arena for much argument. To some it is an outmoded tool; others see it approaching its zenith of interest and value. To know where the truth lies between these extremes has practical significance in the choice of library systems.

It is evident that workers in the information and library fields have different conceptions of what is meant by classification, and Mr Sharp's talk will be an attempt to distinguish between these several conceptions. It will not be an argument for or against the use of classification for bibliographical purposes, but rather that the different conceptions are related to different activities, of which bibliographical problems are only one. We should take care to concern ourselves with those features of both traditional and modern classificatory principles which are relevant to our particular needs.

The meeting will be held at Aslib, 3 Belgrave Square, London SW1, at 5 for 5.30 p.m. Tea will be served.

Aslib Fortieth Anniversary Celebration

We should like to remind members that a reception to mark the fortieth anniversary of the foundation of Aslib is being held in the King's Library at the British Museum, by kind permission of the Trustees, on Tuesday 10th November 1964.

This will be an evening dress occasion lasting from 8 p.m. to 10.30 p.m. and there will be music, drinks and a buffet supper. Admission will be by ticket for which there will be a charge, which will be kept as low as possible so as to enable a substantial number of members to attend.

Course on Abstracting and Co-ordinate Indexing

All students attending the course on abstracting and co-ordinate indexing to be given by Mr J. C. Costello from 5th to 9th October are reminded that the course will be held in the British Columbia Room of the Royal Commonwealth Society, 18 Northumberland Avenue, London WC2. Full details of this course were given in our issue for July this year, p. 208.

Senior Introductory Course to Special Library and Information Work

A senior introductory course to special library and information work will be held at Aslib from Monday 16th to Friday 20th November. It is intended for people holding a university degree or similar qualification who have recently started work in an information department or special library, or for those with experience in other fields who come into senior posts in information departments or libraries without previous experience of the work. The course will teach the principles governing the production and handling of information, and some of the practical details of running an information department or special library. Visits to libraries and information departments are included in the programme and time is allowed for discussion. The fee for the course will be 10 guineas.

A programme and application form are enclosed in this issue, and intending students are advised to apply early. Provisional bookings will be accepted by telephone or telex. As a general rule only students possessing a degree or similar qualification will be accepted for this course, but Aslib will be prepared to consider special circumstances. Anyone who is uncertain whether the course will be suitable for him or her should consult the Education Officer, Mr Bird, before applying.

Scottish Branch Third Information Course

The Scottish Branch is organizing a third Information Course for Friday and Saturday 13th and 14th November 1964, in the Allan Water Hotel, Bridge of Allan. The programme is planned to appeal particularly to non-professional information officers and librarians, as well as to those who usually attend Aslib functions.

Precise details are now being worked out and further information will be given in the next issue of *Aslib Proceedings*. Anyone wishing details before October may obtain these during September on application to the Branch Honorary Secretary, Mr W. H. Rutherford, Royal Society of Edinburgh, 22 and 24 George Street, Edinburgh 2.

Biological Group

The Biological Group held its Annual General Meeting on 21st February and elected the following officers for the year: Chairman, Miss Phyllis I. Edwards; Secretary, Mr Brian Perry; Treasurer, Mr T. Cawley.

At the Tenth International Botanical Congress in Edinburgh in August two sessions were devoted to information retrieval and a committee was set up and directed to prepare and submit a report to the International Union of Biological Sciences. The members of the committee are Dr V. H. Heywood of the University of Liverpool, Dr S. M. Walters, University of Cambridge, and Miss P. I. Edwards, British Museum (Natural History). An English summary of a most interesting paper, 'Ein automatisches Dokumentationsverfahren fur die Bearbeitung biologischer Literatur', was given by Dr M. Scheele, Head of the Biological Information Centre at the Max Planck Institute, Schlitz/Hessen, which it is hoped to have translated and published. Miss Edwards in another paper included the more salient points that emerged from the replies to the questionnaire she sent out to the Biological Group and to universities and university colleges with biological departments.

Electronics Group

The Electronics Group has published the revised issue of its *Handlist of basic reference material for librarians and information officers in electrical and electronic engineering*. The *Handlist* is annotated and covers a wide range of source material, for example encyclopedias, directories, subject bibliographies, valves, tubes and transistors handbooks, tables, and technical writing. It is compiled by Mrs Ellen M. Codlin, Librarian, British Oxygen Co. Ltd Technical Centre. Copies of the *Handlist* are available from the Hon. Secretary of the Group, Miss B. Newman, Ericsson Telephones Ltd, Beeston, Nottingham (price 6*s* to members of Aslib, 12*s* to non-members). Cheques and postal orders should be made payable to Aslib Electronics Group.

Exhibition at Annual Conference

During the Aslib Annual Conference at Exeter the Technical and Scientific Group of the Publishers' Association, in conjunction with the University Book Shop, is staging an exhibition of scientific books.

Apart from standard reference works the books will be those published during the six months prior to the conference. An important section will be devoted to proof copies and details of forthcoming books.

A catalogue of the books displayed will be available. Copies of this catalogue will be obtainable from Aslib after the conference.

Mr B. C. Vickery

Congratulations are offered to Mr B. C. Vickery on his new appointment as Librarian of the Manchester College of Science and Technology. Mr Vickery is well known to Aslib, being a leading member of the Classification Research Group and having contributed a great deal to Aslib publications and conferences. He was until recently Deputy Director of the National Lending Library for Science and Technology at Boston Spa.

Dr S. R. Ranganathan at Rutgers

Dr Ranganathan is to present the Colon Classification at the fourth of the Rutgers seminars, on 19th and 20th November. There will be panel discussion by, among others, Dean Jesse Shera, Mr Robert S. Taylor and Dr Maurice Tauber. Detailed information may be requested from Dr Susan Artandi, Graduate School of Library Service, Rutgers, the State University, New Brunswick, New Jersey, USA.

Patent Office Publications

The progress report set out below has been received from the Patent Office and covers Patent Office printing and publishing for the six months ended 30th June 1964.

Specifications. 16,686 were printed and published; all were available on dates due.

Abridgements

920,001–940,000 Series (last specification 16th October 1963). The remaining 239 sixteen-page sheets were distributed during January 1964; the last few on 28th January.

940,001–960,000 Series (last specification 3rd June 1964). 562 sixteen-page sheets were printed and published during the period.

Group allotment index

940,001–960,000 Series. This was printed and distributed on 9th June 1964.

Consolidated name index

940,001–960,000 Series. The index was published on 21st July 1964.

Subject-matter and name indexes (abridgement volumes)

920,001–940,000 Series. The outstanding twenty-six groups were distributed during January/February (completed on 17th February 1964). Most of the bound volumes were distributed during the period February/April 1964, but four volumes were delayed because of a printing error and were not distributed until 25th June 1964.

940,001–960,000 Series. All proofs have been cleared and all indexes should be ready for distribution with the final sixteen-page sheets of abridgements.

New British Standards

About twelve years ago the International Organization for Standardization began work on the preparation of definitions for terms used in the paper and stationery industries throughout the world. During this period three series of definitions have been issued in English, French, and Russian. To make ISO's work more widely known in Britain, internationally agreed definitions of paper and stationery terms have been available in a British Standard since 1960 and a revision, BS 3203, has just been issued. This gives terms in French and in English, and definitions in English only. Copies of the standard, *Glossary of paper, stationery and allied terms*, may be obtained from the BSI Sales Branch, 2 Park Street, London W1 (price 10*s* each, postage extra to non-subscribers).

The British Standards Institution has also just published *The international system (SI) units,* BS 3763, which should be of special interest in view of the current consideration being given to the metric system in this country. The standard gives authoritative definitions of the new units, made available in English for the first time. The values of units of measurement commonly used in the United Kingdom are also given in terms of SI units. Copies of BS 3763 may be obtained from the address given above, price 6*s* each.

Newspaper Holdings in the North-west

A union list of *Newspapers first published before 1900 in Lancashire, Cheshire and the Isle of Man* has recently been issued by the Reference, Special and Information Section of the Library Association. This is a location list, in four parts, forty-seven pages long. Part 1 gives the libraries and newspaper offices whose holdings are represented; part 2 is the list of newspapers, arranged under town; part 3 is an index of places where newspapers are published or which are mentioned in newspaper titles; part 4 is an index of titles. The editor is Mr R. E. G. Smith, F.L.A., Borough Librarian of Stockport. Copies may be ordered from the Library Association, Chaucer House, Malet Place, London WC1 (price 10*s* 6*d* to members of the LA, 13*s* to non-members, post free).

First International Conference on Soil Mechanics

There has been a long-standing demand from librarians and others for a reprinting of the *Proceedings of the First International Conference on Soil Mechanics* held at Harvard University in June 1936. Arrangements are now in hand for reprinting in December 1964 provided a sufficient number of orders is received. The price would be approximately $35 (three volumes, in hard covers). Orders should be addressed to Dr S. J. Poulos, Pierce Hall, Harvard University, Cambridge, Massachusetts 02138, USA.

Restrictive Business Practices: Comparative Summary

The Organisation for Economic Co-operation and Development has recently published *Restrictive Business Practices: comparative summary of legislations in Europe and North America*. This is a 134-page summary of the differing attitudes towards seventeen points of restrictive business practices law, such as price fixing and cartels, adopted by Great Britain, Canada, the United States, ten Western European countries, the European Coal and Steel Community and the European Economic Community. The *Comparative summary* is designed as a practical aid to using the OECD's *Guide to legislation on restrictive business practices* and contains a table for each of the seventeen points of law included, incorporating brief summaries of the legal position in the countries covered, together with references to the relevant legislation, and to the place in the *Guide* where full treatment is given. Copies of the *Comparative summary* may be obtained free of charge from the Board of Trade Library, 1 Victoria Street, London SW1. (It is not being handled by HM Stationery Office.)

O & M IN THE SPECIAL LIBRARY

E. H. ERNEST JONES
*Management Consultants to the Professions Limited**

Summary of paper given at Evening meeting, London, 20th May 1964

MR E. H. ERNEST JONES, who until recently has been Head of the Central Information Services, Shell International Petroleum Company Limited, gave a talk (summarized here) which was, he said, intentionally short, since O & M work was, he felt, something you do, rather than talk about! Lively discussion followed.

He first outlined the basic approach of O & M to a problem, and then gave some examples of the spheres in which O & M had been effectively used. As a starting point it was to be admitted that O & M was not universally popular because of the inference that there was some incompetence to be revealed, and there was the inevitable resistance to someone from outside proposing methods for improvement. These emotional elements must be faced. The O & M man expected them, and would be the first to disclaim any greater knowledge of, say, library activities than that of the librarian or information officer, and the first to discount any assumption that there was even anything wrong with existing methods of operation. His contribution must be that of fact finding, of relating the facts to the main and detailed objectives of the organization, and of discussing with those in charge any changes for the better which the facts would support.

There was a tendency to stress the 'method' element, rather than the 'organization' element, in O & M practice. This was understandable because improvements in 'method' could be more readily measured in terms of money and were usually capable of implementation on a relatively short-term basis; but, in the speaker's own experience, greater long-term benefits were likely to be produced if more emphasis in the O & M man's brief were given to sound basic organization—and good communications.

The O & M man's approach, to be successful, must be different from that of the head of a department—another cause for misunderstanding. One saw the problems from the outside, the other from the inside. However, the normally accepted mechanics for arriving at an O & M report should be understood. The O & M man should normally agree his report with the head of a department before its submission to a higher level, for the following reasons: firstly, it was a safeguard to higher management that the proposals were considered to be workable; and, secondly, it was essential to good human relations; also it was a very good way for the O & M man to test his recommendations with the people who would be responsible for putting them into practice.

The O & M man recognized that each problem was different, but not necessarily an exception! There was, however, one important variation, and that was the need for a special approach to organization in units consisting largely of professionally qualified people. Top Management was not always sufficiently aware of the difficulties which might arise if this problem was not recognized and solved. The head of a special library would do well therefore, when defining his responsibilities to management, to bear in mind that his duty was not only to ensure that the professional skills were related to the objectives of the enterprise for which the unit was working, but also to fulfil the need to perfect these skills as opportunities presented themselves. He should be under no illusion that his task of convincing management on both these points was simple or obvious!

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* A company of the Sales Audits Group.

Another important element in organization, to which the O & M man should give special attention in a library, was the creation and development of informal organizational relationships—those which do not show on a chart! These were useful provided they enabled librarians and information officers to pool their professional knowledge to produce something effective; but they could be a menace if they became an introverted focus for sterile academic argument. A few pointed questions from an O & M man might serve to reveal the true nature of any such informal group.

Mr Ernest Jones then discussed the administrative methods over which the O & M man's activities must range; reading habits, control statistics, costs, and equipment and machines. He went on to personnel, explaining the important points likely to emerge from analysis of each job in a special library. Lastly he discussed communications, which he felt needed examination just as much in a special library as in any other unit. There were, for instance, always the three viewpoints: the librarian's, the user's, and Top Management's; and the problem of reconciling these effectively was *par excellence* one for O & M to study.

In conclusion, the speaker pleaded for a well-balanced judgment of O & M work, asking his audience neither to under- nor to over-estimate the role it could play. An O & M man studied, analysed, and recommended, but he took no decisions to implement. The responsibility to accept and implement lay fairly and squarely with the Manager.

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DISCUSSION

Miss E. H. Ridler (Ministry of Aviation, TIL) reported they had had an extensive O & M investigation of TIL two years before. They had found it an interesting and enjoyable experience and she could confirm what the speaker had said about the value of O & M support in obtaining equipment. As a result of their O & M investigation they had obtained machines which they would never have had otherwise.

Mr A. E. Cornfield (BP Chemical Co. Ltd) had been involved in an O & M survey of the Confidential Records, Reproduction and Information Services at the BP Research Centre, and could also support the speaker's contention that it was a worthwhile exercise. In fact both sides benefited. One of the benefits had been that old practices which they had believed to have been stopped years previously were observed being carried out *in addition* to the current procedures. The cause of this unnecessary and wasteful duplication was verbal carry over from old to new staff, and the folly of always believing what was told as being practised by the operator, which occasionally did not tally with actual practice. The O & M team check all operations and are therefore able to observe and advise on replicated duties.

He went on to query the advice given by the speaker, that all jobs should be segregated into skilled and unskilled categories and the staff deployed accordingly. This he thought could be a dangerous practice if carried too far, because some of the routine duties could be extremely boring, and unless these chores could be leavened with more interesting duties he knew, from bitter experience, that continuity of staff services was very difficult to maintain.

The speaker replied that the point he had made was the necessity to analyse the jobs to ensure that expensive professional skill was used to the best advantage and *not* wasted on unskilled work. There was no doubt that routine work must in some degree be done by everyone, but by segregating certain routine work, a full and quite interesting job could be built up for unskilled and perhaps less ambitious people, thus providing professional librarians or information officers with more satisfying use of their skill.

Mr F. Liebesny (The British Aluminium Co. Ltd) reported on an O & M investigation of the duplicating facilities in his Department which had resulted in eventual economies; the earlier stages, however, of the improved system were marred by teething troubles for which the O & M management disclaimed any responsibility. Was it right, he asked, that O & M should act only in an advisory capacity? Should the responsibility really lie with the person(s) in charge of the library? As far as job description was concerned, there seemed to be considerable advantages, both in efficiency and job satisfaction, in fitting the job to the person and not the person to the job.

The speaker replied that the O & M man would not wish to disclaim responsibility for his recommendations. He could not, however, decide which of them should be implemented. He was very often asked to *assist* in implementation, but the ultimate responsibility for running the new schemes *must* lie with those in charge.

Mr J. R. Stocks (Shell International Petroleum Co. Ltd) following on Mr Liebesny's comments (that O & M are apt to 'pass the buck'), suggested that Management had one way of ensuring this did not happen—a method used in the speaker's own case, which he hoped Mr Ernest Jones would not mind having quoted.

At the time when the speaker had been in the Organization Planning Division, Shell had ordered an exhaustive O & M survey of their information facilities which resulted in recommendations for the formation of a central information division. The speaker had then himself been appointed to implement the recommendations and to take charge of the division. It had worked!

Mrs W. I. Veasey (B. H. Blackwell Ltd) thought the practice of fitting the job to the person could result in an O & M man's nightmare. It could result in having some very good staff, but it could also result in some very large gaps.

Few libraries had an outside O & M survey. Many librarians and information officers had carried out their own O & M surveys, or followed in the footsteps of predecessors who had all applied their own ideas. If O & M could be described as 'applied common sense' then the assumption must be that few librarians had much common sense! This was not true, of course, but what was true was that O & M required special training, and more important it required an O & M type of mind.

The speaker replied that this was quite a common complaint—the new broom sweeping clean. It was dangerous because so many of the changes were a result of preconceived ideas or prejudices rather than of a careful analysis of the activity. O & M people were trained to avoid the former and concentrate on the latter approach.

Dr W. E. Batten (ICI Head Office) queried the role of the O & M consultant. He asked whether the speaker would agree that it is not the job of the consultant to question the *end* of the service, but only to indicate the methods by which the end should be achieved. In other words should not the 'victim' of the investigation himself be able to explain his objective to the consultant?

The speaker entirely agreed, though the O & M man could assist in clarifying the objectives, which were very frequently obscure or not really known at all.

Mr F. H. Ayres (UKAEA Atomic Weapons Research Establishment, Aldermaston) asked first if it were feasible, or desirable, for an organization like Aslib to provide an O & M service for its members?

The Director replied that Aslib already had a consultancy service which could advise on the establishment and efficient operation of special libraries and information services. Staff engaged in this work must necessarily be capable of thinking in O & M terms and applying O & M principles. However, O & M was a specialist activity requiring training and experience of a particular kind. The most beneficial arrangement was some form of working partnership between the information consultant and the O & M specialist.

Mr Ayres then asked if it were an advantage for members of an O & M team to be specialists in the field which they were surveying?

The speaker replied that he did not think it at all necessary for O & M people to be specialists; in fact it might be a disadvantage to be too specialized, and, as he had mentioned, any special library technique was more likely to have been tested by colleagues in the library profession, with whom it was, therefore, preferable to consult regularly on developments in library and information practice. Familiarity with information problems might, however, speed O & M people in their studies.

THE UDC IN METALLURGICAL LITERATURE CLASSIFICATION: WORK OF THE IRON AND STEEL INSTITUTE

J.P. SAVILLE
Iron and Steel Institute

Aslib Engineering Group Conference, Leamington Spa, 23rd–24th May 1964

SHORTLY after the war, The Iron and Steel Institute was able, through the Occupying Power, to assist the Verein Deutscher Eisenhüttenleute, a body in Germany kindred in some ways to itself, to recover and reassemble its library, which had been dispersed for safety towards the end of the fighting. This operation was carried out by Mr Headlam-Morley, the Secretary, and Professor G. Wesley Austin; the operation was of such importance that they both received, for the purpose, the equivalent rank of brigadier. I was then operating in BIOS with the equivalent rank of captain, and do not think that the two brigadiers and I ever met at the time; we have met frequently since.

It was found that the Verein, which had used an alphabetical classification, was proposing to use the UDC for some of its work, at least, and a later visit, by Mr Post, the Assistant Secretary, and Dr Vernon, the Information Officer, put the Institute into possession of the latest German version of 669, Metallurgy, and of the parts dealing with technology, such as 62 to 66, as well as of the Proloegomena 0 and Sections 1 and 2, Philosophy and Religion. I have not been called upon to use these very much. Also acquired was the Ergänzungen, the cumulated extensions and corrections largely prepared by the Germans while the FID, based in Holland, was in abeyance during the war.

Dr Vernon then set to and translated the German 669. The translation was, for some reason unknown to me, issued as Library Translation no. 174 of the Royal Aircraft Establishment, Farnborough, and published by the Ministry of Supply. This translation became the basis of British Standard 1000 [669] of 1949, with which you must be familiar.

The other parts, however, we did not translate, except (for our internal use) 662, Fuels and Combustion, 666, Refractories, and 620.1 Mechanical Testing, which, of course, included non-destructive testing and corrosion. Very tattered copies of these draft translations are an essential part of the tools of my department to this day, though, as I shall explain later, they will not be so for much longer. The use of the other, untranslated, parts added much to my German vocabulary, though nothing to my grammar. I also remember once having 62 in French, too; this was an extended, but wholly unauthorized, loan from the BSI, and in the end it was missed, and they wanted it back.

The reason that the Institute had adopted the UDC and the use it was making of it are as follows. We had been operating an information department for many years—the late Mr R. Elsdon, with his massive memory, had been virtually a one-man department, but with the formation of the British Iron and Steel Research Association and the transfer thereto of the work of the Institute's Research Committees, we had agreed to provide library and information services for it, as well as for our members. At that time, we were cutting up, and pasting onto cards, not only the abstracts from the new monthly *Journal* of the Institute, but also the back abstracts from the *Bulletin* which had been the fore-runner of the *Journal.*

We were producing far fewer abstracts in those days—some three thousand as against the nine thousand of today—but classification of this back-log occupied a lot of time.

The lack of a complete English text was rather a handicap. I recall now that in addition to the documents I have mentioned, there was a 'black book', a clip-back folder in which were several typed pages of rather abbreviated numbers for what we should nowadays call 'fringe subjects'; but it soon became clear, as the number of abstracts classified increased, that not only did we want a fuller English text, but that, as far as 621.7 and 621.9 were concerned, we wanted a more up-to-date one.

These sections, dealing with metal-working, workshop practice, call it what you will, were of a rather strange construction; 621.7 contained the processes, 621.9 described the machines for carrying them out. At least, up to a point; it seemed that the processes in 621.7 were *plastic* working processes—including melting and casting, as a sort of super-plastic working—but that in 621.9 there were *metal-removing* processes (except, of course, that wire-drawing, rolling and the deep-drawing of metals were also there). But presses for metal working were in 621.9—so were filter presses, for removing solids from liquid.

It is not surprising that, when the FID took the UDC under control again and international contact again became possible after the war, 621.7 and 621.9 came under intensive, almost interminable study. A full history of the meetings, drafts, criticisms, re-drafts, withdrawals of drafts, entirely irrelevant and unworkable proposals, and the last-minute retractions that took us back to where we started, would take a very long time. A list of the towns in Europe where these discussions took place is also impressive—Paris, Copenhagen, Stockholm, Brussels, The Hague, Vienna, The Hague again, and even a meeting or so in London.

Of the three people who could tell you most about it, one is the author of this paper, the second, Mr G. A. Lloyd of the British Standards Institution, has taken refuge in the FID itself, and the third, Mr D. Newcombe of the UDC department of the BSI, who has succeeded Mr Lloyd, has already undergone a fair share of the set-backs that international co-operation always brings about.

At last, however (and it is not yet a year since this happened), the final draft has been prepared—a compromise, like so many of these things. The radicals and the conservatives, the logicians and the empirics, have come to a truce—or fought to a standstill, perhaps. The German experts met last summer with a full translation (well over eighty pages of foolscap) of our (British) proposals before them—one admirable example of German thoroughness—and in a two-or-three-day meeting agreed to accept almost all of it.

The final stages, concession by us of a few points, acceptance by them of just about the same number, took place in Stockholm at the end of last September, and although our deliberations were honoured by the unexplained presence of a Chinese Christian priest from Formosa, it was almost an anti-climax. You will be glad to know that the FID, taking example from such celerity, or blessed by the sanctity, has published the whole of the new schedules in Extensions and Corrections, Series 5, no. 3, which appeared in May 1964.

This ten or eleven years' struggle does not represent all that has been done by the international meetings at which I have had the honour to represent the Institute. In 1957 we made considerable improvements in metallurgy, in 1958 we dealt with welding, and about the same time brought 669–15 *Heat-treated* into line with 621.785 *Heat-treatment.* At odd times, before and since, small but vital alterations—improvements—have been made, though this work has not been equal in quantity (I know) nor in quality (I hope) to that of the last three years.

I have referred to the mixture of BSI editions, Ergänzungen, Extensions and Corrections Series 1 to 5, original German editions, draft translations and torn foolscap sheets which we were using. It had struck me very early that a *single* handbook of all the numbers we were using might be a very good idea, and in 1954 I wrote a paper,* in conjunction with Einar Ohman, then of Jernkontoret, now of FID, on the use of the UDC for classifying metallurgical literature. It was a joint effort, in that we each wrote a part of it. In mine I said that 'selected schedules for the classification of metallurgical literature by the UDC were being prepared.' I referred, as an example, to the ABC, the Abridged Building Classification, which Scandinavian architects had extracted from the UDC. Alas, before mine was finished, there were German selections on measurement, testing, control and protection, and on electrotechnique, and an international one on nuclear technology!

But I did quite a lot of work on it at the time, and got quite considerable help from colleagues in England. The project was really frustrated by the lack of a complete 621.7 and 621.9, by slight obsolescences in 669 which there never seemed time to put right, and by the fact that I had more work and less staff than I have now—or would it be wiser to say simply that I had less staff? In any case, the project went into abeyance for some years.

In 1962, the situation was better, and the necessity for this selection was clearer. Since 1960, the Institute had been issuing its abstracts, in advance of publication in the *Journal,* on 5 in. × 3 in. library cards with UDC numbers.† This UDC numbering was in the first instance done to bring up to date our own UDC index which had fallen rather far behind, and was not much stressed in the general sales promotion. But the cards did have a good sale, and we found that purchasers were certainly using the UDC numbers when they were familiar with the system, and sufficiently interested, when they were not familiar with it, to ask what it was all about. We began to be asked for an alphabetical index to the numbers; we replied that we did not have one, that in any case you could not use an index for classification—it was only a guide to the schedules—and of course that the schedules were mostly available from BSI. But what about 621.7 and 621.9, they replied—and the only answer we could give was that they would soon be coming along now.

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* *Journal of the Iron and Steel Institute,* vol. 177, May 1954, p. 183–8.

† *Journal of the Iron and Steel Institute,* vol. 201, April 1963, p. 310–6.

Finally, we took up again the task of preparing what was first called 'Selected schedules for the classification of metallurgical literature by the UDC', later 'your UDC book' and will now be published as *UDC special subject edition for metallurgy* by The Iron and Steel Institute in its Special Report Series, later this year. It will be letterpress, by the way, not photo-litho or offset, and I think it will be a readable as well as useful document.

As I have said, the situation was much easier in 1962 for beginning this task, and I was hopeful that 621.7 and 621.9 would be ready before it was finished. My optimism was justified by events. But there was still something else to be done. I spoke of certain obsolescences in 669; in fact, beside a number of real out-of-date items, there were a lot of serious omissions. For instance, there was no satisfactory way of denoting the applications of oxygen in steel-making. One could indicate the use of oxygen for accelerating combustion—662.611.25—or the use of the oxygen lance for decarburization—669.046.564—but there were no main numbers for the LD, LD-AC, Kaldo or Rotor processes; what the Americans lump together as 'oxygen steelmaking'. There was no number for steel made by such processes, either, though its properties as a material were being discussed as frequently as open-hearth or electric steel. Denoting the steel was easier than classifying the processes; allowing for the variations of type, and direction, of blast presented a pretty classification problem. I might point out here that the revision of UDC schedules is far more than a matter of addition or substitution. The principles of construction must be observed, and direct and perpetual subdivision is not always the right course, when a common auxiliary may be better, or a number exists elsewhere which may be coloned on. Many UDC users—and non-users—point out that there are often two or three numbers for the same thing; this is quite true, and it has often arisen from the development of certain sections by experts in the subject working in isolation, and with little knowledge of the rest of the UDC and its means of construction. I will digress a little more, while I am on this point, to say that the UDC Department at The Hague and the Central Classification Committee of the FID are very well aware of this nowadays. The CCC is larger and stronger than it has ever been, and is actively encouraging all steps to reduce duplication—for example, the duplication between 66, which covers the manufacture of *chemicals,* and 54, which deals with chemical compounds. A committee is sitting on this very subject. Much can be done by minor revision, all the same; in 669 for instance, there were a number of places where the behaviour of the elements in iron and steel making reactions was enumerated by subdivision, not always of the same figure and not consistently; the range of elements was not always the same. It was possible, however, to make sure that this 'reactions' number did always end in the same figure and would thus be subdivided as one of the auxiliaries, and that any elements involved were indicated by colon to 669.

There were far larger problems to deal with than that, however. If steel-making has changed, so has ironmaking. The blast-furnace, is, for example, cooled at various points; gas, solid, or liquid fuels may be blown into it—even steam—and it frequently works under high top-pressure. It may be charged by a belt-conveyor, and not, as of old, by skips; it may be tapped by the use of explosives; and the iron may be run, not into a pig bed or a casting-machine, but into a water-spray for granulation. The Cowper stove, which heats its great draughts of air, may receive additional fuel; it may even in the future be turned upside-down, if M. Daniel Petit has his way! The open hearth furnace has also received a new lot of gear; water-cooled doors we are used to, but now we have doors evaporatively cooled; they generate steam. We are operating these furnaces on fuel oil, and not on producer gas; the new types of burner must be allowed for. We may blow oxygen into the furnace to increase the heat, or we may inject it through the roof for decarburization; in the latter case, we must water-cool the lance. Our regenerators need cleaning out—this is done with a bull dozer—but though there was a number for slag-pockets, there was none for the cleaning-out of them. Steelmaking processes have become more complicated. The oxygen processes aside, there are more multiplex processes than ever; the old foundry cupola has developed into a large melting unit, capable of supplying a converter, an open hearth furnace, or an electric furnace, with hot metal. But no UDC number for these processes!

Besides my refinements with 'reactions', there was a splendid opportunity of cleaning up the whole of the older processes—the production of wrought iron, directly and indirectly, the puddling process, the old refining processes, Swedish, Walloon, Lancashire, Styrian, the bloomery, the Catalan hearth, and so on. This section was like a badly arranged and badly labelled museum. The processes were described in inordinate detail, and puddling overlapped into steel-making. It turned out that there was room within the framework for a new treatment of these historic processes, putting them into a logical order, detailing the essentials in modern terms, without any violence to existing numbers, or to UDC principles. The detailed work of this, fitted into the intervals of daily work—and frequently during evenings at home—took the summer and autumn of 1962. I then submitted them to a specially selected Working Group of the FID, consisting, besides myself, of Herr Bauhoff of the Verein, Mr Einar Öhman, now of FID, and Dr Petersen, of Metallgesellschaft, a large German non-ferrous firm. We met at The Hague, first in September and then again in December, and, after a little more revision, the new proposals appeared as Note P.784 in March 1963, with a deadline for acceptance of July 1963, should there be no objections. There were no objections.

This cleared the path for a new 669—new because the only true English text in print was still BS 1000 [669] of 1949. The considerable extensions and corrections of 1957 had still to be added to make a proper copy for print. This was, of course, only an editorial job: merely time-consuming, with 250 to 300 separate alterations to be made.

The work had run parallel in time, of course, with the preparation of the selected schedules themselves, in their first and second drafts. The first draft was based on my 1954 version, to which I had added the experience of the intervening years, of what I wanted myself and of what I believed other people wanted. Without 621.7, 621.9 or 669 it ran to over 60 pages. I circulated it fairly widely this time, to Sweden, to Denmark (which has a medium-size and active steelworks, with a *very* active information officer), to South Africa (where both ISCOR, the steel company, and the Council for Scientific and Industrial Research took an interest), to Germany, of course, and in England. From all I received much valuable comment.

I discussed this draft, and the comments, at the meetings in The Hague of which I spoke earlier, and I returned from the second meeting with such a sheaf of new suggestions that, though I blithely dated my second draft 'December 1962–January 1963' it was, in fact, June 1963 before I was able to issue it for further comments and this time it ran to nearly one hundred pages.

Some comment came back, but much less; it was clear that the document was meeting most people's requirements. Except, curiously enough my own; even at the galley proof stage, I am still finding new matter that I want to put in, for instance, in electrical and chemical engineering. I can foresee a second edition, or a sort of pseudo—'Extensions and corrections'. We do plan, in fact, to keep our subscribers posted on new numbers, or existing numbers which it has become necessary to use, through the Occasional Bulletin of the Institute's Library.

However, to all intents and purposes, with a new 669, and the completion of 621.7 and 621.9 at the end of 1963, the text was complete, though there is always a lot to do in preparing for press and reading proofs. And in this case, the mighty matter of the index. You will remember that we had had a demand for this, and in any case, I should not have dreamed of sending it out without an index of some sort.

But it could not be an index to all the numbers, actual and possible; the *possible* numbers, because of the synthesizing nature of the classification, would far exceed those printed. A guide could be composed of the numbers of six figures or less, which would be a very useful indication of the contents, but it would contain far fewer numbers than those printed. In any case, the index could *not* be composed by turning the schedules inside out, as it were; this is not how indexes should be made.

My models for the index were the indexes of the abridged edition and of 669; not precisely refined indexes but, from my experience, very useful guides.

My method of working, therefore, was to read my schedules line by line, and pick out the essential concepts, and then to rearrange the words in these concepts, to the best of my ability, putting myself in the place of a searcher. The mechanics of this process were rather simple; I had four coloured Biros, red, green, blue and black, a special copy of my draft, and a temporary typist in an empty room. With the aid of these several thousands of cards were produced. In some cases a UDC number will produce no index entry, because a searcher will be looking further up in the hierarchy for the concept; in other cases, it may produce two or three, because the concept has—quite legitimately, by common usage—several synonyms, or very close congeners. In other cases, the order in which the words may be sought is a matter of chance, one formulation being as good and as acceptable, in common usage, as another; two cards with the same words in a different order may therefore be needed. This is where the Biros came in, for underlining; red for the first word or phrase, green for the next, and then blue or black.

So far, not a great deal of this index has been collated (that is my next immediate task) but the part done has shown me that this method is producing an index which could be used by a reasonably intelligent searcher This is, after all, part of the object of preparing these schedules—to put the UDC within the reach of people who are not specialists in library work and documentation. I feel very strongly indeed that we information officers must not interpose ourselves and our techniques too impenetrably between the searcher and the information. I am very disturbed at the thought of these black boxes, one metre cube, containing a million, or is it ten million, bits of information; not because of their size, or of the number of pieces of information, but because their method of storage and retrieval depends upon electronic techniques which demand a translation into what is sometimes described as meta-language. 'Meta' means, I think, 'beyond'; at least meta-physics is less comprehensible than physics. But the truth is that the so-called meta-language is simply a very foreign language indeed, known only to the box-operator—and, obviously, to the box. But there is a great weakness in the box-operator's position as a translator. Unlike the common or garden translator, into or out of whatever human speech, he cannot use this particular foreign language as a means of *real* communication; *real* communication involves discussion and the interchange of ideas, involves indirect approaches, and the testing of hypotheses, the postulation and the examination of analogies. I am very much afraid that all the operator can do with the box's language is to force his inquirer's demands to conform to its grammar and vocabulary, and not by any means to establish that rapport between searcher and box which exists between a questioner and a human source of information. Of course, the magic boxes may develop into something more resembling a human brain. If a device were evolved which would accept human speech—or even plain typewriting—and give a verbal, not necessarily a *spoken,* answer from its store of x million bits of information, we might all find ourselves out of a job, but at least we should not be at risk of becoming witch-doctors.

I believe that a great deal of good can come from maintaining the *most open access possible* to information. If we must use a classification—and I think we must—let it not be a *code.* The UDC employs the common numbers 0 to 9, recognizable throughout the civilized world; it is available in all European languages, and Japanese. This is not a code, it is almost a super-language—but not a beyond-language.

We are very willing, at the Institute, for anyone to browse through our card-index boxes. At the moment we allow this quite freely, and practice it daily; the staff uses the UDC to pick out the subject the inquirer wants. But if the user will learn to handle the UDC for himself, and to make his own selection from the boxes, we shall consider that we have gone a stage further in our information work.

In spite of an aversion to black boxes, I do not believe that mechanical storage and retrieval are wholly bad, but I do believe that by the more traditional means of looking and reading you may see connections that no machine can make for you. Nevertheless, the machine-code has not necessarily to depart from accepted ones, and it has been satisfactorily proved that UDC is quite suitable for machine storage and retrieval. Dr Malcolm Rigby, the Chairman of the American National UDC Committee and Editor of *Meteorological and Geoastrophysical Abstracts*, has done a very satisfactory study using an IBM 407 machine, on the storage and retrieval of titles of meteorological and geophysical papers, classified by the UDC. He has produced Keyword-in-context lists, as well as lists of titles classified under UDC numbers and arranged serially. The machine can, in fact, be taught UDC; or, in the jargon, UDC is machineable.

I shall conclude with some reference to a smaller activity by the Institute as part of its efforts to help with the UDC. It was recently decided, at a meeting of the BSI's Committee on UDC, OC/20/4, to pursue a crash programme of translating the whole of the UDC into English. This was, by the way, an alternative to producing a medium-length English Edition, midway between the abridgement and the full edition.

When I say translate the whole of the UDC, I have not forgotten that large sections have been translated, especially in 5 and 6, and that there are draft translations in existence which have never been published. But these, and the published parts, are getting out of date—there are many Extensions and Corrections, and not all have been taken into account. The plan is to produce a full English edition taking note of all these extensions and corrections—as soon as possible.

Volunteers have been found for most of the sections—3 Social Sciences, especially Law, was the hardest to provide for—and the workers will be provided with photostat copies of the German third edition tables, and of the Extensions and Corrections, if they have not got them. Their task is not to consider how the tables could be improved, but to find out what they really consist of, and turn them into English.

With the assistance of Mr R. F. Flint of the Fulmer Research Institute, I have become responsible for 671 to 673 and 682 and 683, which cover between them the precious metal and gem industries, jewellery and trinkets, iron and steel goods generally, non-ferrous metal goods, smithery, farriery, hand-forged iron work, ironmongery and hardware. I feel that this will also add considerably to my German vocabulary.

I do not know what, in the future, the Institute will undertake in the way of UDC work; considerable revisions of the classification are certain to take place in the next few years, but I am sure that we shall be able to contribute to this something, both in the way of technical knowledge and of experience in running an information service based on the UDC.

DISCUSSION

Mr R. Sewell (The United Steel Companies Ltd) asked if the speaker was satisfied that the UDC provided adequately for cross-linkage of ideas? Would schedules be prepared to help with lateral linkage? The mechanisms of colons, plusses, etc., were, of course, available.

Mr Saville replied that the various introductions to the UDC, such as that in BS 1000A, did make it clear how these cross-linkages should be established in actual classification. He would regard these as the grammar, and the schedules as the vocabulary; one did not learn a language by memorizing all the phrases which might be constructed by the use of these tools. But Mr

Sewell's question suggested to him that his introduction should say a good deal about the construction and the analysis of UDC numbers and he would see that it did.

Mr J. W. Marshall (English Electric Co. Ltd) said he was impressed by the scholarship and dedication which Mr Saville devoted to revising the section of UDC for which he was responsible. However, he doubted whether it would ever be possible to keep up-to-date a pre-coordinated (hierarchial) classification scheme in a fast developing field of technology. Would it not be better to develop one of the post-coordinate systems such as Facet or Uniterm?

The speaker replied that as far as he understood the difference between pre-coordinated and post-coordinated, this question appeared to imply that UDC was too rigid, hierarchical and analytic to accept new concepts and that other systems were more flexible in this respect. He did not agree; the UDC was notably synthetic in many respects and, in a changing technology, was no more under a disadvantage than any other. In any classification, whatever its structure and whatever the symbols employed, figures, words, letter-groups, the time was bound to come when new symbols must be devised for new concepts. They did not come out of the air.

Mr J. J. Eyre (G. A. Harvey & Co. Ltd) asked if the Institute had a simple scheme for assisting those unfamiliar with UDC to understand the classified order of filed cards.

Mr Saville said that their intention, in providing the Schedules and a clear introduction to the structure of the UDC, was to help those who *wanted* to use it. As far as their own card index was concerned, they would continue to place it at their users' disposal, but if any of them became familiar with the UDC, through their schedules or by any other means, they would be delighted. But they would not refuse help to people who had not, or did not want, this familiarity.

Mr C. A. Pequignot (Richard Costain Ltd) said the need for an alphabetical guide to UDC numbers suggested that perhaps that guide, if suitably extended, could eliminate the need to replace a perfectly good language, which had a precise vocabulary when properly used, with a list of numbers. Was not UDC making itself unusable by virtue of its necessary and self-perpetuating extension?

The speaker thought this could only lead to the complete extinction of the UDC. An alphabetical index without schedules led to ossification of schedules, and this led to ossification of alphabetical index!

Mr R. Hindson (Colvilles Ltd) said it was pleasant to hear from Mr Saville that the revised metallurgical schedules of the UDC, complete with an alphabetical subject index, were about to appear. He hoped that this would improve the accuracy of the classification numbers used in ABTICS. He estimated that 15 per cent of the information contained in his set of filed ABTICS cards could not be recovered by means of a subject approach. This was due to the lack of an adequate alphabetical subject index to the schedules, typing errors, misclassification, and so on. With regard to the alphabetical subject index, i.e. the 'lead-in vocabulary' for the new schedules, it was disappointing to hear that this index would be limited to concepts rather than topics. There would, in fact, have been by now a very detailed lead-in vocabulary to the UDC as applied by ABTICS if, the first time a new number had been used, the service had issued a card giving the number and a word description of the topic or concept represented.

Mr Saville said that Mr Hindson had stated that 15 per cent of the information in ABTICS cards could not be recovered because of *a*, inadequate indexes, *b*, typing errors in the cards themselves and *c*, misclassification. Each of these was a rather sweeping criticism, and it would seem that they all should multiply to a figure worse than the 85 per cent recovery that was implied.* They were also a little contradictory in that, if an alphabetical index were so important, its lack should make mistyping and misclassification impossible to detect. If Mr Hindson had detected errors—and he did not deny that they could occur—it must have been through a greater familiarity with the schedules themselves than he would admit to. Familiarity with the schedules was, after all, the aim of classifiers and searchers; an alphabetical index to a UDC schedule was only a guide. The schedules turned inside out, as it were, with every word in the schedules alphabetically arranged against its UDC number, would, in his view, defeat its purpose. It would not provide the lead-in vocabulary that Mr Hindson requested because it would be very much congested with little used terms. An index, therefore, should only offer a skeleton. That it should be even fuller than the schedules—and this was implicit in Mr Hindson's request for topics and not concepts—he could not accept; knowledge of the UDC would soon teach Mr Hindson how the numbers for concepts combine to make the classification of topics.

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* This is, after all, very close to the mean of the Cranfield recovery figures, where there was no question of the lack of an alphabetical index.

The issue of cards giving the numbers when employed for the first time and a word description of the topic or concept would only, if he had understood the nature of these cards aright, lead finally to 'UDC on cards'. The speaker thought that when Mr Hindson saw the Special subject edition for metallurgy he would realize that this was unnecessary. Mr Saville thought he would also find that the alphabetical index was adequate.

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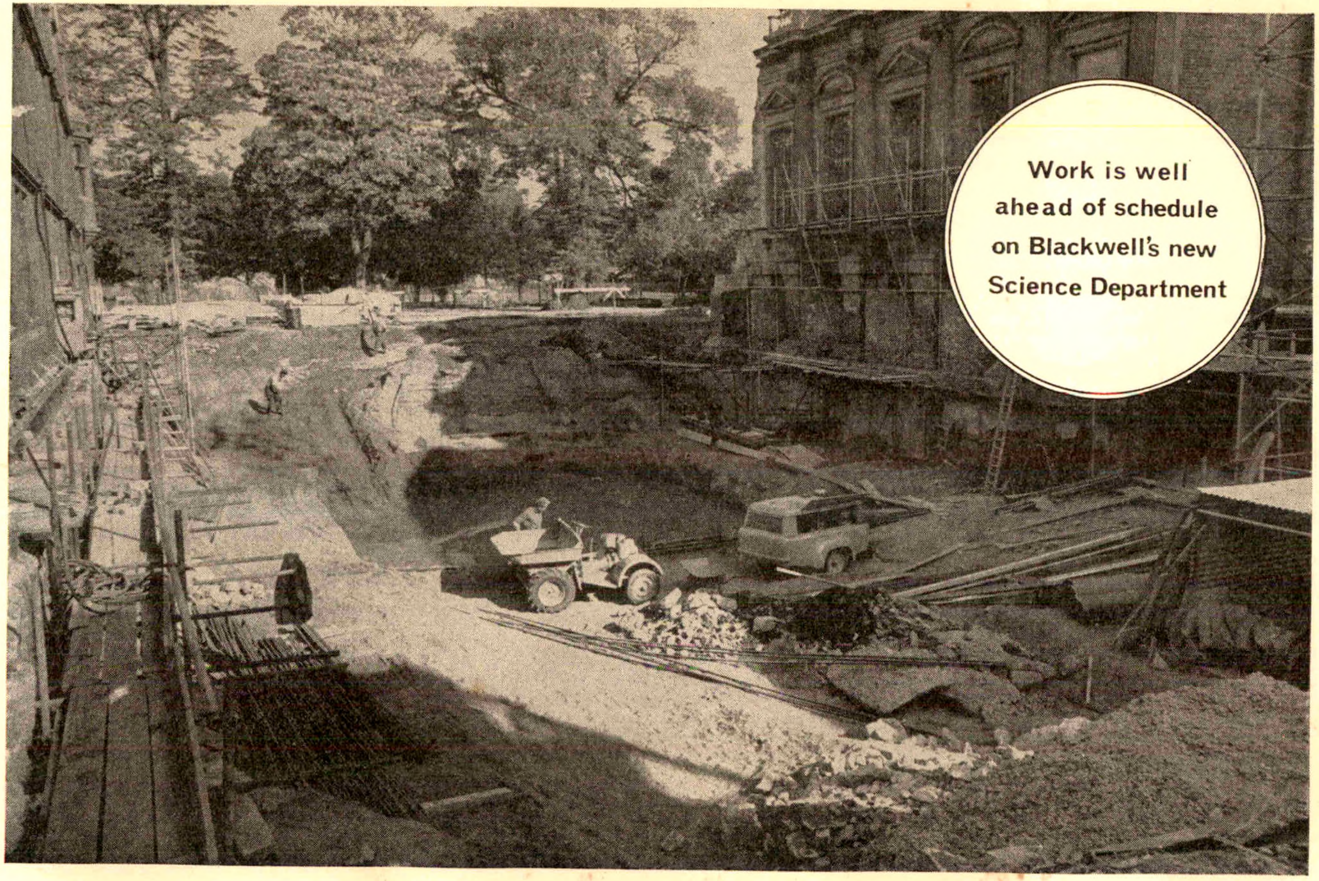

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October

THUR.22. Evening meeting at Aslib, 5 for 5.30 p.m. 'What is classification?', by J. R. Sharp.

TUES.27 – FRI.30. Junior introductory course to special library and information work.

November

TUE.3. Midlands Branch meeting, Imperial Hotel, Birmingham, 6.30 p.m. 'Using the new BUCOP', by K. I. Porter.

FRI.6. Aeronautical Group Winter meeting at TIL and Royal Aeronautical Society, and sherry party.

TUE.10. Aslib fortieth anniversary reception.

FRI.13. Technical Translation Group sherry party.

FRI.13 – SAT.14. Scottish Branch information course. See paragraph below.

MON.16 – FRI.20. Senior introductory course to special library and information work.

THUR.26. Evening meeting at Aslib, 5 for 5.30 p.m. 'Dissemination of published information to the executives of a major steel group', by R. Hindson. See paragraph below.

December

WED.2. Engineering Group meeting at Richard Costain Ltd, 5.15 for 6 p.m. 'Tunnels, tubes and the channel', by C. A. Pequignot.

MON.7 – THUR.11. Repeat of course on abstracting and co-ordinate indexing.

WED.23. Aslib Christmas sherry party. Admission by ticket.

Aslib evening meeting

The November evening meeting will be held on Thursday 26th November, on 'The dissemination of published information to the executives of a major steel group'. The speaker will be Mr Richard Hindson, ALA Information Officer, Colvilles Limited. The Chair will be taken by Mr Julian Blackwell of Blackwell's, Oxford. Mr Hindson will illustrate from his experience in the iron and steel industry how free interchange of information can be achieved within an industry. An increasing number of companies are raising the calibre of their executives by management development and training schemes, but as far as the speaker is aware no group other than Colvilles is evolving a scheme which ensures that, once managers and specialists are appointed to particular posts, they are kept informed of developments relative to these posts. Mr Hindson will describe the information service that has been set up on these lines by the Colville Group of Companies.

The meeting will be held at 3 Belgrave Square at 5.30 p.m. Tea will be served at 5 o'clock.

Scottish Branch Third Information Course

Details of the information course to be held in November are now available as follows. The course will be held on Friday and Saturday 13th and 14th November at the Allan Water Hotel, Bridge of Allan. The speakers will include Mr J. G. Hall, Librarian, Esso Research Ltd, Abingdon, on 'Obtaining information and making the most use of limited resources'; Mr C. W. Cleverdon, Librarian, College of Aeronautics, Cranfield, on 'Indexing methods for quick retrieval'; Mr M. C. Pottinger, M.C., Librarian, Scottish Central Library, on 'Local sources of information in Scotland'; and Mr A. C. Low, of DSIR (Scottish Office), on 'DSIR and industrial liaison'. The cost of the course, including lectures, accommodation, gratuities and meals (lunch on Friday to lunch on Saturday inclusive), will be not more than 5 guineas. Applications to attend should be sent to Mr W. H. Rutherford, Royal Society of Edinburgh, 22 and 24 George Street, Edinburgh 2.

New DSIR Observer

Mr P. D. Greenall, M.SC., who is a senior principal scientific officer in the Industry Division of DSIR, is welcomed as an Aslib DSIR Observer as from 1st September. Mr Greenall takes the place of Mr A. C. Nicholas, B.SC., A.R.I.C., to whom thanks are extended for his work on Aslib's behalf. Aslib's other DSIR Observer is Mr J. C. Gray, M.A.

Card-holding Platen for IBM Typewriters

IBM have recently announced that a card-holding platen is now available in the United Kingdom for use with the IBM Executive typewriter. With this device one can type single entries on cards for a sequential card camera (e.g. Listomatic). IBM claim that the Executive typewriter is considerably less expensive than the machines that have previously been used for this purpose. Further information may be obtained from the Communications Department, IBM United Kingdom Ltd, 101 Wigmore Street, London W1.

Research Grant for Processing Metallurgical Abstracts

The National Science Foundation has made a grant of $74,000 to the Center for Documentation and Communication Research, Western Reserve University, for research in 'Automatic processing of metallurgical abstracts for the purpose of information retrieval'. The aim is to develop a set of rules for automatic indexing in the field and so to cut down the time lag between the appearance of an article and its index. The project will be directed by Mrs Jessica Melton. Details may be obtained from the WRU Office of Public Relations, 2040 Adelbert Road, Cleveland 6, Ohio, USA.

Science Citation Index

A new low rate has been fixed for certain subscriptions to second copies of *Science Citation Index*. It applies to departmental and other affiliated libraries of libraries in the same area already subscribing to a copy of the *Index* and gives a 50 per cent discount. Full details may be obtained from the Institute for Scientific Information, 325 Chestnut Street, Philadelphia, Pennsylvania 19106, USA.

An Index to Manchester and its Region

This is the title of an index to *Manchester and its region*, the descriptive regional volume produced for the Manchester meeting of the British Association, held in 1962. The index, published in 1964 by the Manchester University Press, is compiled by the Manchester and District Division of the Association of Assistant Librarians under the editorship of Mr M. J. Harkin. Copies may be ordered from Mr Harkin at the Central Library, St Peter's Square, Manchester 2 (price 2*s*).

Special Library Resources in the North

The Northern Group of the Library Association Reference, Special and Information Section has recently issued a mimeographed *Directory of Northern special library resources*. There are fifty-eight entries, with a subject index, covering industrial, scientific and technical college libraries in Cumberland, Northumberland, Durham and Tees-side. The directory is compiled by Mr G. R. Stephenson, B.A., A.L.A., and is available from Northumberland County Technical College, Hawthorn Road, Ashington, Northumberland, price 5*s* a copy (free to contributors).

BUSINESS RECORDS FOR THE FUTURE

T. C. BARKER, M.A., PH.D.

*Department of Economic History, London School of Economics**

Chairman, G. Woledge, Librarian, British Library of Political and Economic Science
Evening meeting, London, 20th February 1964

THERE is a certain lack of reality about our approach to the preservation of business records. We are only too eager to discuss the academic, archival problems, but singularly reluctant to face the more pressing truth—that the overwhelming majority of business men have not the foggiest notion of the importance of these records to them, and consequently are quite unaware of the need to preserve them. Why should they show any concern? After all, a business man's interests lie in the present and the future, not in the past. His job is to grapple with new ideas, not with old papers. And, in any case, these old papers take up shelf space which becomes progressively more expensive as site values rise. Why keep all this lumber? To heave it all out is, at first sight, the cheapest solution. Consequently, as office accommodation becomes more valuable, the heaving process continues apace while the faithful discuss the technicalities of preservation on the quite unfounded assumption that most business men are becoming converts to preservation. We have got our priorities wrong. We should be spending much more of our time in trying to persuade the owners of business records that there is gain to them in keeping a carefully selected portion of their old papers for historical purposes. A great deal of evangelism is called for before we can spend the greater part of our time discussing just how these records should be preserved.

Business history obviously provides some of the raw material for the writing of national economic history. Some of the more far-seeing companies have begun to stake their claim to a place in the national story by promoting histories which can be handled by a commercial publisher and sold to the general public in the usual way as well as distributed among staff and customers. Volumes such as Professor Charles Wilson's *History of Unilever,* published in 1954, and Professor R. S. Sayers' *Lloyds Bank in the history of English banking* (1957) indicate the kind of honest, informative and readable book which can be produced. Full-length business histories like these have been known to sell as many as ten thousand copies; they not infrequently sell five thousand. They are to be found in private homes and on library shelves. They are drawn upon by historians in general, including the writers of textbooks. To ensure that a particular concern gets credit for its part in regional or national development is, surely, public relations activity of the best sort—a good return for a very modest outlay.

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* Now Professor of Economic History, University of Kent at Canterbury.

Such full-length histories, of course, cannot be written without adequate documentation from within the company. The faded memories of a few old employees is no substitute for the real documentary evidence. This internal material can then be filled out and put into its setting by reference to background sources—trade journals, parliamentary papers and so on. The competent business historian can, in fact, produce quite a workmanlike volume with a comparatively limited amount of original source material; but there is an irreducible minimum below which he cannot operate effectively. The wholesale heavers are therefore depriving themselves of ever having a worthwhile history written. Perhaps they themselves could not care less about past achievements. Or the time may not yet be ripe to admit the historian; the present board may fear the rattling of skeletons. But sooner or later, if the business continues to prosper, someone somewhere in high places will want to know what happened in earlier times; and the inevitable centenary or some other cause for celebration is bound to create curiosity. There is, therefore, a strong and convincing case, from the point of view of the business man's own self-interest, for keeping some of the company's old papers. But much more effort needs to be made than is at present made to put the case over.

Exhibitions of business records, such as the one recently arranged in Birmingham by Mrs Barbara Smith, are a useful means of focusing interest in business records provided business men can be persuaded to go along to them. Perhaps some examples of various kinds of full-length histories which have already appeared may also be an aid in this process of persuasion. A short list of them will be found in the Historical Association pamphlet *Business history* (price 5*s*, available through booksellers or direct from the Association, 59a Kennington Park Road, London, SE11). Guildhall Library has produced a very much more detailed handlist containing more than eight hundred titles dealing with London business houses alone (available from Guildhall, price 1*s* 6*d* plus 4*d* postage). Most of these items, however, are no more than short glossy trifles of very limited value, lost opportunities rather than business histories. But perhaps the awful warnings may prove as good propaganda as the quality products, provided the latter are available for comparison.

No doubt a further aid to persuasion is some assurance that it will be necessary to preserve only a fraction of the company's vast output of paper. For most concerns, time, salvage drives and moves of office have already weeded out most of the older records. It is rare for much to survive from before the later nineteenth century and this should all be kept, for it will not take up much room. The real problem arises with the mass of paper produced by the Parkinsonian present and the recent past. How is this stifling effluent to be transformed into a controlled by-product?*

This daunting and disturbing subject has been discussed by Aslib and other bodies on a number of occasions. The difficulty is that the problems are so considerable that one is bound to generalize about them to such an extent that what one says becomes platitudinous. The plain truth is that businesses are as different from one another as are people. And just as it is impossible to generalize satisfactorily about people, so it is impossible to generalize satisfactorily about businesses. Each has its own character and personality, and this character and personality inevitably stamps itself indelibly on the records.

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* The analogy is used by Mr R. C. Jarvis in a paper read to the conference on business records on 27th March 1957. The full report of this conference, to be found in *Aslib Proceedings*, vol. 9, no. 6, June 1957, provides a valuable introduction to the subject.

To start with, however, there are various broad distinctions that can be made. The obvious one is between those concerns which produce goods and those which do not: between industrial and commercial businesses. In the case of industrial undertakings there is the complex problem of the manufacturing records, including information about mechanical innovations, often calling for fairly detailed technical interpretation. Then there is the matter of raw material supplies, frequently drawn from distant parts of the world, countries about which much must be known in order to understand price movements. All manufacturing industry buys raw material and uses processing machinery, but there is obviously such a variety of both that very broad generalization about archival problems becomes rather meaningless. The archivist, in short, has to try to have a good grasp of the particular branch of industry with which he is concerned before he really knows how to sort out, calendar and index his material. Moreover, he has to know the particular office characteristics of the particular business with which he is dealing.

When we turn to the other broad category—commercial undertakings, which do not make anything themselves but buy and sell products made by others or provide services of some kind—there is not the problem of the technical nature of the manufacturing records. But there are other highly specialized features, equally technical in their own way; the intricacies of particular types of commercial paper, for instance. The banking world, in particular, forms a highly individual branch of business. There is, in addition, the selling side of both commercial and industrial undertakings to be taken into account. The market may be wholesale or retail, or it may be both. It may be a home market or a foreign one, or it may be both. Whichever way one looks at all this, the only generalization that can reasonably be made is that no generalization can be very meaningful.

In the light of the individuality of particular firms, perhaps there is something to be said for thinking not (as we have done up to now) of business archives in the mass, but rather in terms of the particular archives and archival problems of particular businesses. What is needed, to start with, is for the historian and the archivist to collaborate in sorting out and preserving the kind of material that they are likely to want in each particular case. Broadly speaking — and here we are merely indicating and not falling into our own trap and generalizing in any comprehensive way—it is the policy documents that need to be kept and the day-to-day working papers which can be thrown out. The board minutes are essential, but not always very helpful; they record the conclusions reached, not the behind-the-scenes tussles which led up to those conclusions. Any high-level memoranda or personal correspondence is often of particular value for purposes of interpretation. On the accounting side, the grand totals are essential but many of the individual items need not be preserved. Correspondence and dealings with leading customers are valuable on the sales side. In these days of takeovers, the papers of rival concerns often fall into the hands of the takers-over. A former competitor's records are often most valuable sources of knowledge about both companies and should be particularly prized.

Although weeding along these lines will save a great deal of office space, there may be particular circumstances which may cause some business men to think twice about the feasibility of keeping even this greatly reduced body of books and papers. In these special cases there should be available some alternative to destruction. Here libraries or record offices may be helpful. Universities, too, are often willing to receive business records. Glasgow University, in particular, has shown the way in recent years, Dr P. L. Payne, the Colquhoun Lecturer in Business History, having been outstandingly successful in gathering in business records there on a large scale. Other universities would no doubt be glad to rescue business records in danger of destruction. Perhaps some of the new universities, with their extensive sites and spacious libraries, may soon prove particularly responsive to appeals for help. On their side, they would gain records of value for historical research purposes. The business man, in return, would be spared storage costs and yet would still gain the public relations benefit from any research work that was subsequently published. Gain without any expenditure should prove a sound economic proposal capable of being sold to most practical men of business.

AUTHOR'S SUMMARY OF DISCUSSION

In the discussion Mr McGuiness (Institution of Heating and Ventilating Engineers) and Mr Snell (Danish Bacon Co. Ltd), expressed doubts about the extent to which faith could be pinned upon the main policy documents, Mr McGuiness going so far as to suggest that 'what business men think and say they are doing does not necessarily correspond with what they are doing'. Was it not necessary to collect some of the detailed records as a check? Mr Landmann (individual member), speaking as a management consultant, felt that recent board minutes and private correspondence were likely to give the future historians only a very partial picture of what actually happened. Mr Cornfield (British Petroleum Co. Ltd) stressed the need to emphasize the space-saving side of selective weeding if business men's interest was to be aroused. Mr Coleman (Shell International Petroleum Co. Ltd) thought that nothing was likely to impress management of the need to preserve their records so much as a stream of requests from university research students for information from them. Miss Lewkowitsch (individual member) felt that, in the case of smaller firms, the key to preservation was the offer of storage space in repositories, particularly if an assurance could be given that confidential records could be preserved under seal for a limited period. Dr D. J. Campbell (Pressed Steel Co. Ltd) emphasized the value of archives dealing with technical matters, particularly where long periods of development were involved, and Miss Clarke (Imperial Chemical Industries Ltd) also drew attention to the importance of technical records for the documentation of major advances in technology. She wondered, too, whether it would be useful to retain samples of day-to-day records which, though perhaps of little use to the general historian, might be of interest to someone who was concerned with some particular, detailed aspect of past development. Cdr Doble (Secretary of the Business Archives Council) suggested that if articles based upon, or extracts from, a firm's business records could be published in its house magazine, this would be a good means of arousing interest in the subject. He also mentioned the successful courses on record management which had been organized by the Business Archives Council and begged Aslib members to give their encouragement and support to the work of the Council. Mr Riley (J. Lyons & Co. Ltd) felt that archivists would appreciate the advice of historians concerning records that were likely to be needed eventually for historical purposes. Dr Barker said that those economic historians on university staffs who were working in the field of business history would be glad to give such help. At present, however, they had no idea who would welcome it. The initiative must come from the owners of the records.

An early example of collaboration between University and Industry

Extracts from a letter by Joseph Black, the eminent professor of Chemistry at the University of Edinburgh, who in 1790 advises his brother, the London manager of the British Plate Glass Co., on a technical problem and refers to a steam engine which James Watt has recently installed at the company's factory at Ravenhead, St Helens (facing page).*

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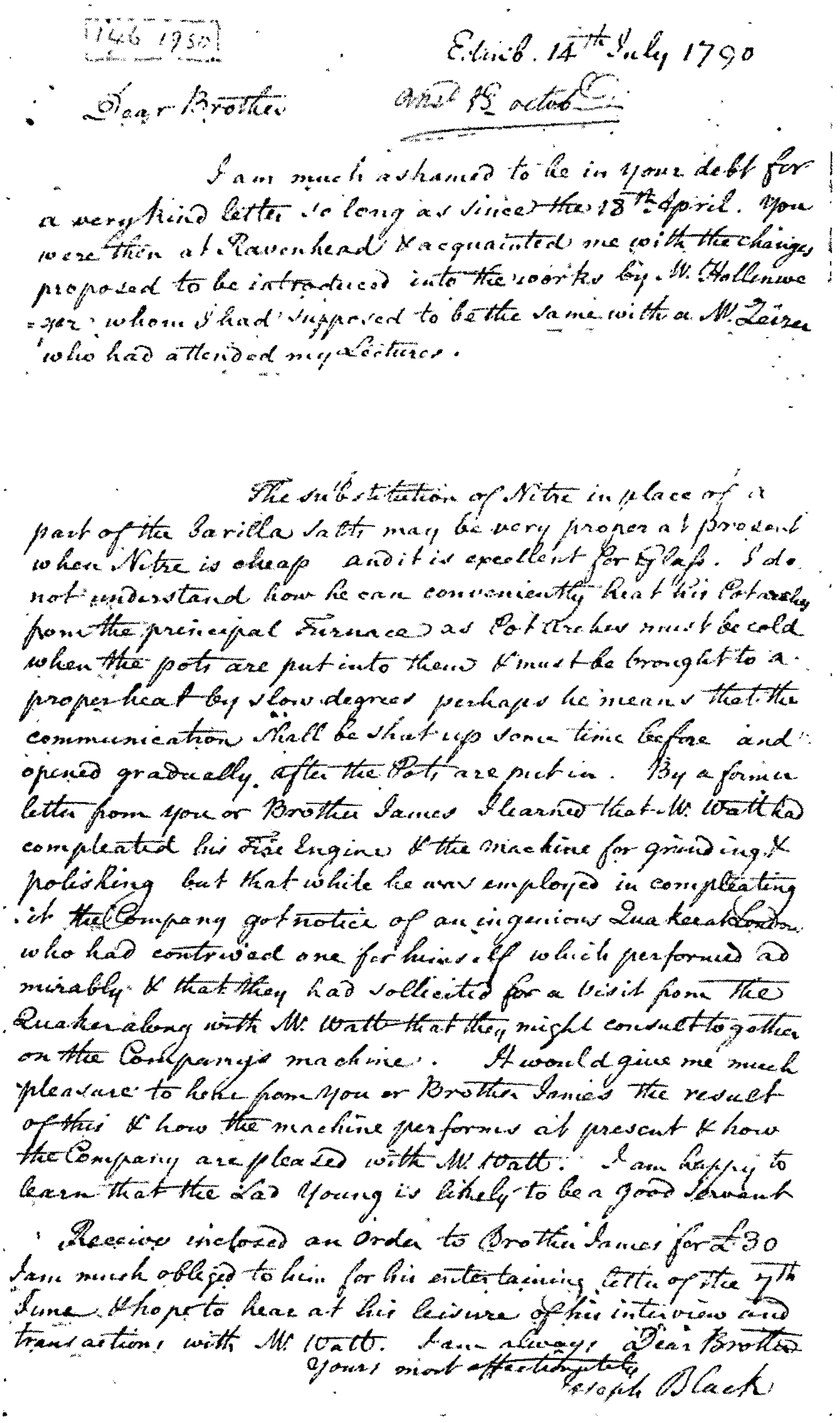
* Photograph by permission of the Ulster Museum, Belfast. Photostats of this and other letters between the two brothers have been acquired by Pilkington Brothers Ltd who are about to appoint an archivist to take charge of all their historical records. These will be housed in Pilkingtons' new glass museum at Ravenhead, to be opened by Sir Kenneth Clark on 5th November 1964.



1146 1950

Edinb. 14th July 1790

Dear Brother Ansd 18 Octob.

I am much ashamed to be in your debt for a very kind letter so long as since the 18th April. You were then at Ravenhead & acquainted me with the changes proposed to be introduced into the works by Mr Hollenweger, whom I had supposed to be the same with a Mr Zeizer who had attended my Lectures.

The substitution of Nitre in place of a part of the Barilla Salts may be very proper at present when Nitre is cheap and it is excellent for Glass. I do not understand how he can conveniently heat his Pot arches from the principal Furnace as Pot Arches must be cold when the pots are put into them & must be brought to a proper heat by slow degrees perhaps he means that the communication shall be shut up some time before and opened gradually after the Pots are put in. By a former letter from you or Brother James I learned that Mr Watt had compleated his Fire Engine & the machine for grinding & polishing but that while he was employed in compleating it the Company got notice of an ingenious Quaker at London who had contrived one for himself which performed admirably & that they had sollicited for a visit from the Quaker along with Mr Watt that they might consult together on the Company's machine. It would give me much pleasure to hear from you or Brother James the result of this & how the machine performs at present & how the Company are pleased with Mr Watt. I am happy to learn that the Lad Young is likely to be a good Servant

Receive inclosed an Order to Brother James for £30 I am much obliged to him for his entertaining letter of the 7th June & hope to hear at his leisure of his interview and transactions with Mr Watt. I am always Dear Brother

Yours most affectionately
Joseph Black

PROGRAMMED INSTRUCTION AS A MODEL FOR INFORMATION RETRIEVAL

G. HARRY McLAUGHLIN, B.A.

Northampton College of Advanced Technology, London

Chairman, Gordon H. Wright, County Technical Librarian, Hertfordshire
Afternoon meeting, London, 29th April 1964

LIBRARIANS and teachers have essentially the same function—providing information. However, they cannot claim with Dr Johnson: 'Sir, I have found you an argument; but I am not obliged to find you an understanding.' Both librarian and teacher should present knowledge in such a way that the inquirer is able to comprehend it. One way is to guide the inquirer into working out ideas for himself. Such guidance involves presenting the information in a coherent sequence of easily assimilated steps, after each of which a question is posed to check that that step has been understood. This is what a good tutor does. This, too, is what Programmed Instruction does.

A programme is a well-ordered exposition prepared for self-tuition by splitting it into simple steps, called frames, each of which incorporates a test of the reader's understanding. A programme can be produced in book form, but most people find it more fun to study programmes presented by means of a device called a teaching machine.

Generally a student can learn from programmed instruction in about two-thirds of the time he would take to learn equally well by any other system. The catch is that it takes about ten times as much effort to produce an effective programme as it does to write an ordinary book.[1, 2] None the less, I think it certain that librarians can expect an avalanche of programmes in the forms of microfilms, books and loose sheets. For those who wish to know in more detail what is going to hit them, excellent surveys of Programmed Instruction have recently been published.[3, 4, 5]

As sometimes happens in education, the experts disagree. The big and little-enders of Programmed Instruction are in conflict about the most suitable length for frames. Professor B. F. Skinner of Harvard University believes that frames should be so short and simple that nine times out of ten the student answers each test question correctly—and the knowledge that he has answered correctly is considered to be a reward to the student. As Skinnerian frames are always presented in a fixed sequence, they are said to form a linear programme. It is not without significance that Skinner became interested in Programmed Instruction after discovering that if a rat or pigeon is rewarded every time it moves even slightly in a required direction, the subject quickly learns to dance figures of eight and to perform other unlikely activities. Skinner has a sort of non-theory of psychology, proclaiming himself interested only in observable stimuli and responses—not in any hypothetical cognitive processes that may be going on inside his subjects.

At the other extreme, Dr Norman Crowder prefers page-long frames followed by fairly searching questions to check that the information has been properly integrated with previous knowledge. Here the alleged reward is the 'aha!' experience the student gets when he finally understands. This 'common-sense' approach implies a theory of cognitive maps; that is to say, Crowder evidently believes that human beings set up mental maps of the world which they revise on the basis of new information.

But students have different cognitive maps, so to convey an idea to different students, different numbers and kinds of frame may be needed. Therefore, instead of keeping to a linear programme, Crowder introduces additional sequences of frames to which the student is directed if his answers reveal that he needs additional information. In practice, these remedial sequences are short and always return to the main sequence, so, although they are usually said to form branched programmes, it would be more topologically correct to call them looped programmes.

FLEXIBLE PROGRAMMES

In principle, as many branches or loops may be introduced into a programme as would be necessary to give each student an entirely individual course of instruction. Some students might study, say, a mathematical presentation of a certain topic; others, who find mathematics difficult, might be directed to a preliminary loop sequence of frames explaining the necessary mathematics, or they might study an alternative branch, which presented the topic in non-mathematical terms. Those who made errors in a test given after a summary section could be washed back to restudy frames they had evidently not grasped; those who showed great understanding could be washed forward, missing out certain supporting frames. These stratagems appear in some complex experimental programmes which depend on an electronic computer to order the individual learning sequence. But perhaps the nearest approach to a completely flexible programme is contained in *Meet yourself as you really are,* a book of just over two hundred pages, subtitled *about three million detailed individual character studies through self-analysis.*[6]

In any branching programme the sequence of frames that an individual studies must be determined by his responses. In the simplest case, if he answers a question correctly, he goes on to the next frame of the main sequence; if he answers incorrectly, he goes on to a remedial sequence. Yet this still implies the somewhat naïve belief, even more strongly demonstrated in the Skinnerian approach to programming, that one need only go on reiterating a concept for a student to comprehend it eventually. Doubtless if he is told often enough how he should respond he will at last produce the 'right' responses, but not necessarily with conviction or even understanding.

Adaptive teaching machines, first devised by Gordon Pask, seek to diagnose a student's difficulties at a rather deeper level.[7] Investigation will show that difficulties encountered in carrying out exercises in any skill can be assigned to a (usually small) number of categories. In an adaptive teaching machine a register is provided for each category of difficulty, including special difficulties arising from the interaction of two or more misconceptions. Each test item is previously analysed in terms of these difficulties, so that every response a student makes goes to build up a cumulative record of his ability to comprehend various aspects of the instruction provided. A mechanism continuously evaluates this record, based on all previous responses, causing the machine to select instructional and exercise material that is just within the student's capacity up to that moment.

Using an adaptive teaching machine is very much like consulting a librarian. Both the machine and the librarian do more than provide information; they also learn about the inquirer's difficulties. This conversational exchange of information is often essential to finding wanted material in a library, because the inquirer may have only a hazy idea of the topic about which he wishes to learn, or he may have mentally put it into a different category to that allocated by the library. The librarian therefore has to find out which of his categories best matches the inquirer's real interest.

The adaptive teaching machine and the librarian are also similar in that both employ classificatory tags. The machine's registers are each tagged corresponding to a particular class of difficulty. The librarian's documents are each tagged corresponding to a particular class of knowledge.

Classification is intended to save the librarian time and effort by ensuring that if one requisite item of information is located, all other relevant items will be located simultaneously. In other words, a library classification orders information by the criterion of relevance. Again there is an analogy with Programmed Instruction, because the coherent sequence of information constituting a programme is also ordered by the criterion of relevance.

Yet it is not correct to speak simply of relevance. It is only meaningful to speak of relevance to a specified person. This, I submit, vitiates nearly all classificatory systems so far proposed. Those systems which depend upon referring to a list of predetermined categories necessarily reflect the list-maker's ideas about what constitutes a category. How widely list-makers' views differ is shown by there being more facets in Ranganathan's philosophy schedules than Dewey ever dreamed of. There is even more scope for disagreement when the list-maker arranges his categories hierarchically: the UDC classifications for psychology have little relevance to the structure of the discipline as seen by students in this century, while inter-disciplinary studies like cybernetics and psycho-linguistics can hardly be accommodated by the system.

Many of these difficulties are overcome by automatic class-forming systems, such as the clumping procedure devised by Needham.[8] These systems depend upon detecting co-occurrences of terms, so they do at least measure the mutual relevance of words to groups of authors, and they can retrieve probably wanted documents even if the search terms are not fully stated. But the problem of relevance remains; automatic class-forming is based on the assumption that a statistical measure of terminological similarity is an adequate measure of semantic similarity. This is not always true. For instance, two disciplines may use two completely different sets of terms to describe concepts which are yet closely related in the mind of an inquirer making an inter-disciplinary study. The system will not detect the relationship he perceives between the two terminologies until his papers explaining the relationship have been written and fed into the system! This is a serious limitation if an information store is intended to facilitate creative research, rather than to serve merely as an archive for historical study.

Present systems of automatic class-formation therefore need to be supplemented by taking account of the inquirers' concepts of relevance. In other words, an information retrieval system should discover what an inquirer really needs to know, and supply information which the inquirer himself considers relevant to that need, just as a librarian does. As we have already seen, a librarian must do this through conversational interaction; we have seen, too, that an adaptive teaching machine also operates by conducting what is in effect a conversation. It should therefore be possible to formalize librarian-like conversation in order to provide what may be termed topic retrieval.

TOPIC RETRIEVAL

Topic retrieval is a concept intermediate between fact retrieval, which provides answers to questions, and document retrieval, which provides documents in which answers may be found. Fact retrieval presupposes that the inquirer can specify the information he wants exactly. Document retrieval presupposes either that he can recognize whether each document offered is relevant or not from its title or, alternatively, that he is willing to read at least an abstract of every likely document in order to find out whether it is relevant. These assumptions are, in the experience of many librarians, not commonly met.

In topic retrieval the inquirer would first put a question in ordinary language to the system. In return it would offer a topic, that is, a small set of key sentences derived from those documents which contain most of the terms given in the question. If the inquirer was not fully satisfied, he would inform the system of the respects in which the topic needed alteration, and would then be offered a revised topic. As soon as the system offered exactly the topic of interest, the inquirer could call for the main facts and the corresponding documents from which the topic was derived. After the information had been examined the inquirer might pose a new question, or the system could spontaneously offer related topics, in case they were also of interest.

To achieve such usefulness an extremely complex computer system would be required, and we must review its possible operation in more detail before considering just how topic retrieval might be realized. To begin with, information would have to be put into a more or less permanent memory. As an abstract amounts to the topic of a document, the system would have to read abstracts. Each abstract would be broken down into a set of simple declarative sentences, but without detaching adjectives or adverbs, so that each sentence would preserve its meaning even when taken out of context. At the same time non-technical terms would be translated into a limited vocabulary of Basic English to avoid the occurrence of synonymous words in the system. Before being put into the system's memory, each sentence of the revised abstract would be tagged with the same number as that which served to locate the document from which it was derived.

Assume that an inquiry has been put to the system. It is first automatically translated into the system's restricted language, and then matched against every abstract in the memory. Each abstract containing more than a certain proportion of the inquiry's terms is copied into a working store, the abstracts being put in order of the number of search terms they contain. The top twenty or so abstracts in the list are then processed by a deductive logic programme to yield further sentences implied by those already contained in the abstracts. The implied sentences are added to the list and they, together with the original abstracts, are evaluated for information content—sentences with the highest information content being defined as those which imply others but are not themselves implied. (Obviously, mutually contradictory sentences, which imply all sentences, have the highest information content of all. It is important for a researcher to detect these. But the deduction programme includes a stop rule, so that no other sentences can be derived from them!) Finally, about ten sentences with the highest information content are printed out to provide the first topic.

The inquirer perhaps replies that he is not concerned about certain items mentioned in the topic. Abstracts which include these terms are thereupon deleted from the list held in the working store, and a new topic is formed as before. This time, possibly, the inquirer points out that he is more specifically interested in certain terms; the abstracts in the store are examined for these additional search terms and the list is restructured accordingly. Once again a new topic is produced, and this process continues until the inquirer is satisfied that the topic closely matches his interests. He obtains a print-out of the start of the list, and, when necessary, he calls in the corresponding documents by number from a separate document store. The inquirer continues his examination down the list—which can, if required, continue to be amplified by the logic programme—until he finds the material too peripheral to his interests.

SIMULTANEOUS SEARCHES

Meanwhile, as the inquirer does not indicate that he wishes to pose a new question himself or to discontinue the search, the topic he has selected has been treated by the system as a new inquiry, and a new list is being set up in another working store. Abstracts which the inquirer has already examined are deleted from the second list. Thus, as soon as the inquirer indicates that he is not interested in seeing more of the material produced by the first search, the first working store is cleared completely and the second store spontaneously offers a new topic. Other inquirers would have been interrogating the system simultaneously, their number being limited almost exclusively by the number of stores available.

Even topic retrieval would be blinkered to some extent by the categories of language, because searches depend upon the matching of terms. However, this defect would be largely overcome by putting all topics of interest into the permanent memory, so that terminological relationships accepted by one inquirer would be available to guide his successors.

All this is a dream, as foolish and as impractical as the notion of supersonic airliners must have been to Bleriot's contemporaries. But in principle every requirement of a topic retrieval system can be met by modern techniques. Let us check this assertion by examining the four main requirements.

1. *Abstracts must be read into the system.* Present input mechanisms, such as electric typewriters, would be adequate, though character-recognition devices which could read documents directly would, naturally, save an enormous amount of tedious clerical work. Inquirers could use the same input mechanisms, but again effort would be saved if reliable speech recognizers could be developed. The storage of documents and their retrieval by location numbers is, of course, commonplace. However, a problem does arise if a document contains no abstract. To provide data for topic retrieval one of two courses could be selected: either the title could be treated as the abstract, or else the whole document could be translated into the system's language and the title treated as an inquiry, which would result in the production of a topic, but one based solely on the sentences of the document, so that it would be an auto-abstract.

2. *Abstracts and inquiries must be translated into a restricted natural language.* Although fully automatic high-quality translation from one natural language into another has not yet been achieved, and may not be possible in principle, few serious problems arise when the target language is the same as the source language. Terms can be transliterated by seeking equivalents in a dictionary. Syntax can be simplified by applying a form of transformational analysis.[9] The specification of the restricted language will largely depend on the logic programme.

3. *The inquiry must be matched against every abstract held in the memory.* If search times are to be reasonable, the inquiry would have to be replicated many times over, so that each replica could search through only a small part of the memory. The replica would act like a shopper going from counter to counter ordering items, with the differences that these items would be dispatched to a working store and that, when the shopper reached the last counter in the section, she would be killed! Obviously this 'shopping' calls for logical work to be carried out in the memory. Until recently components that could perform logical operations were very expensive, so computer memories consisted simply of storage registers. Now, however, cryogenic memories promise to make logic facilities as cheap as storage—furthermore, cryogenic components function in thousand-millionths of a second. Cryotron circuits suitable for topic retrieval were designed three years ago,[10] when the concept of 'shoppers' moving around the memory as organized entities was also proposed.[11]

4. *Lists must be compiled and restructured in the working stores.* In the fast-moving world of computer technology, list programming is by now a venerable technique. None of the procedures that need to be carried out in the working store should present insuperable problems to today's programmers. An adaptive fact retrieval system incorporating many of the facilities required for topic retrieval is under development.[12] Cooper[13] has presented an algorithm—albeit not a powerful one—for making logical inferences from sentences in a restricted natural language. Harrah[14] has made a promising study of information content measures; indeed they might have more applications in topic retrieval than that suggested above.

Finally, let us consider the need for topic retrieval. With the exponential increase in scientific literature, there can be no doubt that extremely powerful information retrieval systems will become essential. The question is, which form of retrieval would best meet future needs?

Fact retrieval will provide answers to fully specified questions. In many areas this may be most valuable, but, in a sense, all the questions must be trivial because a fact retrieval system is limited to making deductive inferences, whereas major scientific advances come from inductive leaps—such as concluding from the fact of two phenomena being similar in some respects that it may be worth investigating whether they are similar in others. If a fact retrieval system had to make such inferences it could not be restricted to the realm of plausibility, because in two thousand years of logical study nobody has succeeded in adequately formalizing inductive thinking.

On the other hand, document retrieval depends on categorizing documents together in classes of knowledge. This limits a search to a particular part of the memory, which reduces not only costs, but also the likelihood of finding novel yet important associations. Like all classification systems, document retrieval makes the implicit assumption that classes of knowledge approximate to the structure of the real world. But it may be that these classes merely express the psychological structure which men's minds impose upon the data they abstract from a universe with a nature very different to that which they suppose. Then the very permanency of the system will impede men from reorganizing the information it contains to suggest new ideas.

Topic retrieval would locate documents without reference to predetermined classes, and would not only provide deductions but also inductively related facts. Yet just as the adaptive teaching machine keeps the student's interest by always setting him problems just within his capacity, perhaps the greatest appeal of a topic retrieval system might be that it would keep the inquirer's interest by restoring to him the ability to browse.

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Letter to the Editor

THE NEW BUCOP

Dear Madam,

An item on 'The new BUCOP' appeared in the July 1964 issue of the *Aslib Proceedings* in the section labelled 'Aslib Information'. It seems to me that only the second and fourth paragraphs of this item could qualify as 'information', while the rest, while too superficial to be called a critical review, yet contained certain critical comments. I would not like it to be thought that the NCL and the Editor of BUCOP were unduly sensitive to criticism; indeed, the article on the new BUCOP which appeared in the June issue of the *Aslib Proceedings* specifically invited comments on the publication, which would be given most serious consideration. However, it seems to me that the points made by your 'reviewer' can and ought to be answered.

In commenting that the first issue of BUCOP appeared in June although it 'was due in March', your reviewer draws attention to the not unusual circumstance of an initial delay in publication. The original month designation was retained in order to conform to the general publication programme, in which all four issues will appear within a single calendar year. It is hoped that in the course of this first production year publication will come to coincide with the month on the issue.

Since he does not amplify his remark that the first issue is 'disappointing in content', I can only hazard a guess on what he has in mind. The original BUCOP brought its coverage up to 1960, though not fully for that year, and the fourth edition of the *World list of scientific periodicals* covers the period 1900–60. This leaves a backlog of material to be dealt with. Since it was our intention to establish as soon as possible the practice of listing the latest information of value to users in the quarterly issues, we have attacked this backlog retrospectively from 1963–4, rather than progressively from 1960–1. In point of fact, titles appearing in the later issues range over the entire 1960–4 period, and will continue to do so until we are up to date, at least with the more important material, and pending the production of a five-year cumulation which will unify and expand the information published in the first publication years. Inevitably it will take the appearance of several issues or even of the first annual cumulation before the content becomes generally useful; meantime the principle of 'qualitative selection' must be applied.

As to the remark that the new publication is disappointing in appearance, your reviewer appears to be demonstrating a prejudice against computer-produced records, which sounds old-fashioned to say the least. Considerable trouble has been taken with the layout in order to overcome some of the visual disadvantages which might be held to inhere in the process of publication by computer print-out, and your reviewer's suggestions are not particularly helpful in this connection. A further indentation of the section of library symbols would reduce the amount of space available, already uncomfortably tight, for printing these symbols, together with information on holdings, and surely the single-line space between the main part of the entry and the library symbols obviates the need for further indentation? Since there is a double-line space between each entire entry, I do not see that the symbols could possibly be taken to apply to the title *following* them.

The new symbols are alleged to be 'unnecessarily complex', whereas an attempt has been made to make them both simple and logically consistent. A mnemonic for the name of a library is really only helpful to those who are familiar with a wide range of British libraries by their names, and assuming that there are a number of librarians and non-librarians who have this knowledge, do they then also require an indication of their location? It seems to me that either a complete mnemonic or a complete abstraction was required. The experience of the previous BUCOP seemed to suggest that it is impossible to secure a really unique mnemonic code for each library, even with their separation by place; on the other hand, the place-type approach appeared to be useful in supplying valuable information about the best locations to approach, before looking up their actual names. In any case, the new symbol has been designed for use by the computer in producing separate lists (at some future date, as required) for particular areas, or for particular types of library as designated in the symbol, either for the country as a whole or for any particular area.

Finally, a complaint is made of the selection of library locations where a title is widely held. Space is of course always at a premium in union lists, and besides adding unnecessarily to cost it could be that the printing of an excessive number of locations, even when separated according to the type of holding (complete, continuous or partial), would be fatiguing to the eye as well as confusing to the mind. In fact both the original BUCOP and the *World list* applied a principle of selection, as shown by the following quotes from their introductions. BUCOP: 'It was considered unnecessary to load the entries of commonly held periodicals with records of fragmentary sets. . . . Again, in the case of a highly specialized library, attention has been directed towards including the holdings of its special material rather than of the general material it may also happen to possess in common with many other libraries.' *World list:* 'We have attempted, as far as time would allow, to record in accordance with the information received the holdings of every contributing library for every title unless a holding was for only a very short period of a periodical's life and the title was well represented in a good coverage of other libraries.' One advantage of the new BUCOP's method of selection, and a very important consideration in relation to available staff-time, is that the selection is made by the computer. On the other hand, the excluded entries are not completely lost, and could be printed by altering the instructions to the machine; this would probably be done, for example, in printing a partial list for a particular area, etc. I am not in fact aware of any serious criticism hitherto of the principle of selection as applied in the original BUCOP or in the *World list*; however, if it were widely and strongly felt that completeness of the record in this connection outweighed considerations of space, such an alteration in current policy could, as I have indicated, be easily accommodated.

Yours faithfully,
K. I. PORTER,
Editor, *BUCOP*

The National Central Library,
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1st September 1964

SELECTIONS FROM THE RECENT LITERATURE

ALL ITEMS listed may be borrowed from the Aslib Library, except those marked *, which may be consulted in the Library.

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LIBRARIAN required for the International Planned Parenthood Federation, to run and develop a small library as part of the expanding Information Department. The library has a specialized medical section as well as more general sociological and economic information on population. Candidates should preferably be under 25, have completed the Registration examination and have experience in all aspects of special library work. Initial salary will depend on experience and qualifications. Please write, giving full details, to Miss P. Gordon, IPPF, 64 Sloane Street, London SW1, marking the envelope 'confidential'.

For Sale

Bound volumes of *Engineering* from 116 to date, in good condition, for sale. Please reply to Box Number, 964.

Two steel periodicals display racks by Roneo. 42 in. wide, 66 in. high, double-sided, storage approximately forty titles each. Illustration available. £20 each or offers. Librarian, The University, Southampton. Tel. 56331.

LIBRARIAN

Applications are invited for the position of Librarian to a large firm of Chartered Quantity Surveyors in the London West Central area. The applicant will be required to initiate, organize and manage a technical library and information service related to the building and civil engineering industry. A knowledge of architecture and building will be of advantage and preference will be given to a University graduate. Write stating age, experience and salary required to:

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CENTRAL LIBRARY

Aslib Proceedings

incorporating Aslib Information

A New Look at Feature Card Indexing:
A Symposium on Aspects of Practical Application

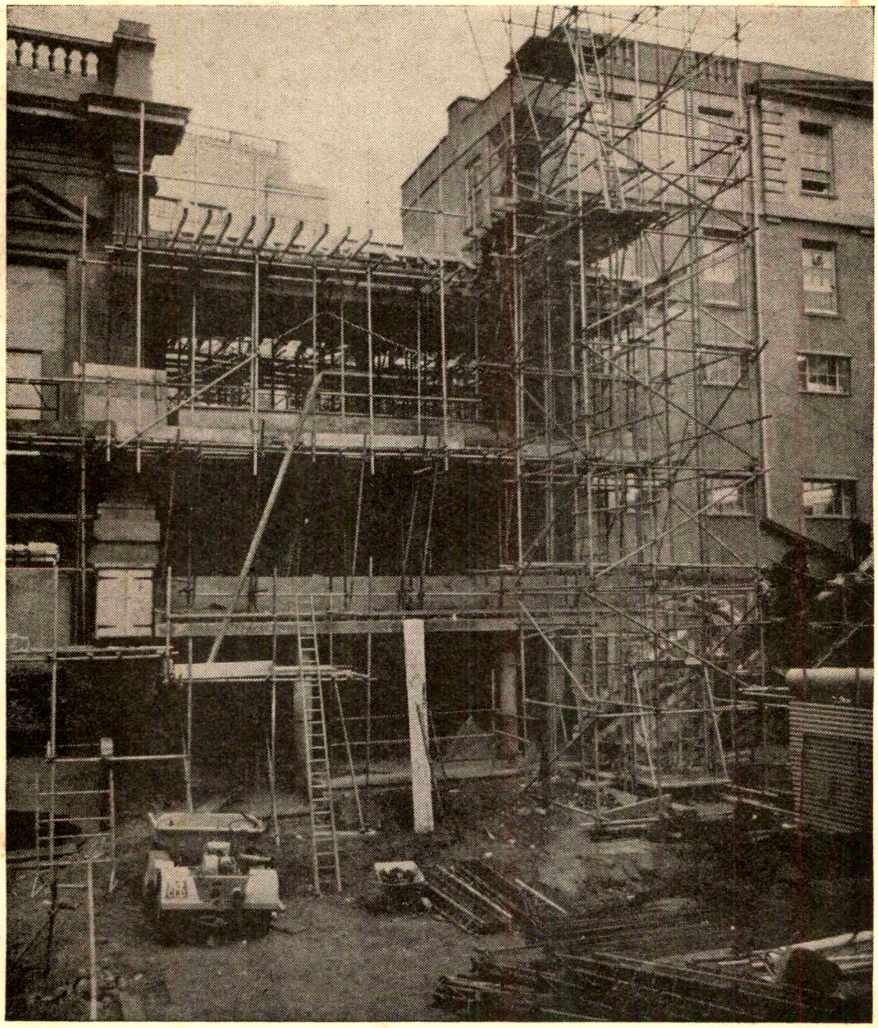
CHAIRMAN, W. E. BATTEN

Mechanization in Documentation:
The Ministry of Aviation Technical Information and
Library Services

H. F. VESSEY

ASLIB · 3 BELGRAVE SQUARE · LONDON SW1

Aslib Proc. vol.16 no.11 p.325-359 London, November 1964



Flowline for you in February

Three storeys up and two to go on the first of Blackwell's new office extensions. In February the inland ordering, invoicing and despatching will be done here on the latest flowline technique. This will mean quicker, more accurate, more flexible and more personal service for you.

CALCUTTA UNIVERSITY CENTRAL LIBRARY

ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 **November 1964** **Number 11**

ASLIB CALENDAR 1964

November

WED.25. Chemical Group sherry party and brains trust at Aslib.

THUR.26. Evening meeting at Aslib, 5 for 5.30 p.m. 'Dissemination of published information to the executives of a major steel group', by R. Hindson.

December

TUE.1 – FRI.4. Repeat of junior introductory course to special library and information work. See paragraph below.

WED.2. Engineering Group meeting at Richard Costain Ltd, 5.15 for 6 p.m. 'Tunnels, tubes and the channel', by C. A. Pequignot. See paragraph below.

WED.2. Film Libraries Group meeting at Shell Centre, 6.30 for 6.45 p.m. 'Television rota services', by Joyce O'Donovan.

MON.7 – THUR.11. Repeat of course on abstracting and co-ordinate indexing.

WED.23. Aslib Christmas sherry party. Admission by ticket.

1965

January

FRI.1. Technical Translation Group annual general meeting at Aslib, 3.30 p.m. 5 p.m., 'Interpreters at international conferences', by A. T. Pilley.

WED.6. Film Libraries Group meeting at Shell Centre, 6.30 for 6.45 p.m. K. Brownlow's film on Nazi occupation of Britain.

WED.13. Electronics Group winter meeting and sherry party at Aslib.

THUR.21. Engineering Group conference at Aslib, 10 a.m. 'Industrial market research.' See paragraph below.

TUE.26. Evening meeting at Aslib, 5 for 5.30 p.m. 'Challenge of the new university libraries.'

Mr H. P. Luhn

News has reached us of the death on 19th August of Hans Peter Luhn, President of the American Documentation Institute since October 1963. Born in Barmen, Germany, in 1896, Mr Luhn went to the United States in 1924. He joined IBM in 1941 and worked there until 1961, when he retired and became a consultant to industry. Although Mr Luhn was known by relatively few people in Britain, his contributions in the field of mechanization are widely known. During his time at IBM Mr Luhn was at the source of a steady stream of innovations in the field of information retrieval. Among the projects he initiated, or developed, are: Keyword-In-Context Indexes, automatic abstracting, statistical methods of automatic indexing and selective dissemination of information. He was a prolific writer and some of his publications are already classics. Mr Luhn will be remembered as one of the great pioneers in library automation.

Mr L. J. H. Haylor

The sudden death of Leslie Haylor will have come as a sad shock to his many friends in Aslib. An electrical engineer and a chartered patent agent, Mr Haylor was intimately concerned with technical information matters from the early fifties onwards as Assistant Director, Technical Information and Library Services (TIL) in the old Ministry of Supply and subsequently in the Ministry of Aviation. He was a frequent attender at Aslib conferences and meetings, and a founder-member and Vice-president of the Institute of Information Scientists. He retired from the Ministry of Aviation earlier this year.

Junior Introductory Course to Special Library and Information Work

More people than ever before applied to attend the junior introductory course held in October. To meet the needs of the many students who applied too late the course will be repeated from 1st to 4th December. The numbers have been so great that it is unlikely that any applications will be accepted from students who have not already applied. Another course is planned for March 1965.

Engineering Group

There are two events in the Group's winter programme. The first will be held on 2nd December at Richard Costain's Lecture Theatre, 111 Westminster Bridge Road, London SE1, and will be presented by C. A. Pequignot who will speak on 'Tunnels, tubes and the Channel'. The second is a one-day conference at Aslib headquarters entitled 'Industrial market research: information and techniques', to be held on 21st January 1965. The fee will be 30*s* inclusive of lunch. Full details of both events will be sent direct to group members, but non-members and potential members who would like to attend either or both of these functions are asked to write to the Secretary, Aslib Engineering Group, British Institute of Management, 80 Fetter Lane, London EC4.

Lord Shackleton

Members will be pleased to know that Lord Shackleton, who is President of Aslib, has received a Ministerial appointment in the new Government. Lord Shackleton is now Minister of Defence for the Royal Air Force.

DSIR Visitors to Aslib

Dr T. E. Allibone's appointment as a DSIR Visitor to Aslib ended on 30th June and our thanks are extended to him for his long and active support. Dr Allibone's successor is Mr A. H. A. Wynn, Scientific Member at the National Coal Board. The second DSIR Visitor to Aslib is Professor D. V. Glass, who is Martin White Professor of Sociology at the London School of Economics.

Mr N.E.C.Isotta

Congratulations are offered to Mr Isotta, formerly of the Ministry of Aviation Technical Information and Library Services, on his new post as Deputy Head of Documentation at the European Space Research Organization in Paris. Mr Isotta's resignation from Council and from the Aslib Electronics Group Committee has been regretfully accepted; his past services are greatly appreciated.

The Future of Chemical Publications

In 1963 the Chemical Society authorized a Publications Survey 'to study and report on the needs, problems and possible developments in the publication of chemical information', to be carried out by its Director of Publications Research, Dr R. S. Cahn.* To provide an opportunity to discuss the views and some of the findings before the Report is finalized, a meeting was held at the University of Nottingham from 22nd to 24th September 1964 on 'The future of chemical publications'. There were about two hundred participants, a very representative gathering of chemists and information officers from universities, government departments and industry and a number of foreign guests. The fourteen papers were divided into three main sections; primary sources, secondary sources and other aspects.

The range of questions covered was very wide and brought with it a diversity of views and highly contentious discussions. In what follows an attempt will be made to report on the most stimulating and contradictory opinions and to summarize the positive suggestions made.

Dr Cahn pointed out that in chemistry in one sense the doubling period is eight rather than fifteen years (abstracts printed in *Chemical Abstracts* were 1947, 42,000; 1955, 84,000; 1963, 167,000). Therefore sheer quantity would force a reduction of the length of the traditional scientific paper by removing the experimental details to some form of microform storage, associated with computer retrieval. The extent to which specialist journals launched by commercial publishers is an obvious trend suggests that the division of the *Journal of the Chemical Society* into specialist parts is long overdue.

However, lengthy discussion on possible breakdowns showed no agreement whatever. Considerable savings in volume and time would arise from the plan advocated in Professor Bernal's paper. Primary publication would be in the form of longish, detailed summaries (not abstracts) submitted to the usual refereeing, with the full paper available on demand. Unfortunately all the beneficial gains resulting from these innovations as well as other short-term remedies would probably be wiped out in one doubling period, that is by 1970.

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* Announced in *Aslib Proceedings*, vol. 15, no. 6, June 1963, p. 156.

In discussing the love-hate relationship between the learned society and the commercial publisher, Mr C. M. Hutt pleaded for more co-operation to reduce duplication and to raise standards (eliminate junk) by strengthening editors in the performance of their vital role. Since it is essentially an international problem he suggested that it would be necessary to create an International Commission on Publications which could bring the academic and professional world together with the publishers.

Dr Tate (Assistant Director of Chemical Abstracts Service) provided some very significant figures by which to assess the present state of chemical documentation and outlined their plans both short-term and the foreseeable future. Thus the 185,000 abstracts to be published in 1964 recording 400,000 compounds (of which 75,000 are new) will fill 27,000 pages and will contribute some 10,000 pages to the quinquennial collective indexes when they appear. Various devices for reducing the time-lag in the appearance of abstracts have been developed to the limits of the possible and the hope for the future now lies in using computer methods which have been the subject of research over the past five years. The first product is *Chemical-Biological Activities,* an index to current literature on the biological activity of organic compounds, which is due to appear in January 1965. This computer-produced monthly will be based on the automatic handling of about one million entries a year. There seem to be good prospects that in a few years time the use of a cathode ray tube display system will permit the inclusion of structural pictures with text in a computer print-out. However, Dr Tate warned that the costs of such operation are so high that repeated duplication of the same effort in various parts of the world would be prohibitively expensive.

In summary one might say that whereas there was wide divergence of opinion on how chemical information should be communicated, on how chemical literature should be controlled, there was general recognition that the growth was becoming unmanageable and that the computer was the great hope, provided that it gave every chemist what he wanted.

Classification Research at Elsinore

A second International Study Conference on Classification Research was held in Elsinore, 14th–18th September. It was organized by the FID/CR and the Danish Centre for Documentation and was assisted financially by the National Science Foundation, Washington, and the Danish Technical Research Foundation. The scale of the Conference was considerably larger than that of its predecessor at Dorking in 1957; some sixty representatives from sixteen countries attended, reflecting the various disciplines now contributing to research in classification.

A wide view of 'classification' was taken, treating it as synonymous with subject indexing, whether this is implemented by conventional card catalogues or by machines. There was sensible recognition from the start of the central role of classification in information retrieval and of the fact that the computer has come to stay. Papers ranged from problems of a general classification to the requirements of generic codes for computers, from 'automatic classification' (of course!) to the face-lifts which existing classifications like the UDC may get from computer aids. Problems of evaluation and testing were also prominent, as would be expected.

Evaluating Document Retrieval Systems

The Center for Information Resources is to hold a course on how to increase the operating efficiency of document retrieval systems and reduce operating costs. There will be three repeat courses of one week each, beginning 8th, 15th and 22nd March 1965; the lecturers will be Mr C. W. Cleverdon, Mr Robert Fairthorne, Mr Saul Herner and Mr Wilfrid Lancaster. The courses will be held in Washington and the tuition fee is $200. Preliminary reservations should be made by 1st December to Center for Information Resources, Inc., 2431 K Street, NW, Washington, DC 20037, USA.

Palaeography Classes

There is room for a few extra students (who need not necessarily intend to take the Library Association examination) on next year's palaeography course at the North-Western Polytechnic, designed to lead to Paper B 92. Classes will be held on Wednesdays from 5.30 to 7.30 p.m., and the fee for January to December 1965 is 48*s* plus 2*s* student membership fee. Applications should be sent as soon as possible to Mr P. G. New, School of Librarianship, North-Western Polytechnic, Prince of Wales Road, London NW5.

Training in Indexing

The Society of Indexers is to run a course of ten weekly lectures on indexing at the School of Librarianship, North-Western Polytechnic, beginning on Wednesday 20th January 1965. Some instances of the papers to be given are 'The long index (humanities)' by Mr J. C. Thornton, Vice-President of the Society; 'Scientific and technical indexes' by Mr E. J. Coates, Editor of BTI; and 'Indexing of current business records' by Mrs M. Markham-Lee, Superintendent of Central Registry, ICI.

The lectures will be from 6.30 to 8 p.m.; refreshments can be obtained at the Polytechnic refectory. The fee is 30*s* for the whole course or 5*s* for each lecture, and applications to attend should be made to Mr G. Norman Knight, 3 Western Mansions, Barnet, Hertfordshire, as soon as possible and in any event not later than 1st January 1965.

Film in Research

A report on *The film in scientific research* has been issued by the Department of Scientific and Industrial Research as the result of a working party survey and questionnaire instigated in 1960. The working party was set up in the first place to consider proposals which had been received from outside the Department for the creation of a national scientific film laboratory, and a detailed inquiry was made into the use of scientific cinematography in research. The report surveys, for example, government military and atomic energy research establishments, engineering and medical science departments in universities, and industrial laboratories and firms. Problems of photographic training and technology are discussed and there is a chapter on developments overseas. Copies of the report may be obtained free of charge from the Information Division, DSIR, State House, High Holborn, London WC1.

Factfinder

Kalamazoo have now entered the punched card field with an idea new to this country. It is a system, called the Factfinder, which operates on edge-notched cards and an electric joggler; the cards have no pre-punched holes (which makes them stronger) and are notched in the normal way. When a pack of cards is to be sorted, bars are inserted horizontally at the bottom of the joggler through marked holes. Between two hundred and three hundred cards can be sorted at a time and these are placed in the magazine resting on the inserted bars. When the magazine is made to vibrate, the cards with notches corresponding to the bars drop down; the operation is completed in three seconds and is claimed to be 100 per cent successful. Jogglers and cards are in three sizes and can be printed to any specification or fitted with aperture microfilm. Further information may be obtained from Kalamazoo Limited, 21 Kensington High Street, London W8.

NEW MEMBERS

CORPORATE

Name	*Locality*	*Representative*
Alberta. University of Alberta, Calgary	Canada	Miss M. E. Skeith
Anchor Chemical Co. Ltd	Lancashire	B. Pickup
Association of Teachers in Technical Institutions	London	W. J. Ballantine
BP Chemical Co. Ltd	London	A. E. Cornfield
Badger Ltd	London	W. A. Holve
Bennett, T. P., & Son	London	A. B. Carley
British Lighting Council, The	London	Miss B. Trigg
British Railways, Southern Region	London	
Cambridge Institute of Criminology	Cambridgeshire	M. Wright
Cambridge Instrument Co. Ltd	Cambridgeshire	G. L. Young
Carreras Ltd	Essex	Mrs M. Almond
Chamberlain Aeronautical Enterprises	Surrey	G. R. Chamberlain
Chertsey Public Library	Surrey	C. F. Ball
Colin McIver Associates Ltd	London	A. D. Murray
Comision de Bibliotecas de la Comision Nacional de la Academia de Ciencias	Cuba	
Crane Ltd	London	C. Filmer-Pasco
Direccion General de Bibliotecas	Cuba	
Display Motor & Accessories Co. Ltd	Middlesex	M. B. Taylor
Douglass Mathews, J., & Partners	London	M. Ryan
Dundee Technical College	Angus	N. Craven
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Gallaher Ltd	N. Ireland	Miss M. A. Nelson
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Industrial & Process Engineering Consultants (Great Britain)	London	W. R. Beswick
Institute of Office Management	London	Miss I. Broom
Instituto de Investigaciones Tecnologicas	Colombia	N. Young
Irish National Productivity Committee	Ireland	G. O'Hara
Israel. Embassy of Israel	London	Dr Z. Rotem
J.R.H. Products & Co. Ltd	Berkshire	J. T. N. Heygate
James North Exports Ltd	London	G. D. J. Hay
Johns-Manville Co. Ltd	London	C. Ward
Kent. University of Kent at Canterbury	Kent	G. S. Darlow
Library Services of Fiji	Fiji	R. L. Pearce
Lintas Ltd	London	Mrs M. F. Payton
London & Thames Haven Oil Wharves Ltd	London	J. D. F. Nichols
Loughton College of Further Education	Essex	M. J. Freeman
Midlands Electricity Board	Warwickshire	F. C. Duffield
Minnesota Mining & Manufacturing Co.	U.S.A.	Mrs V. Brown
National College for the Training of Youth Leaders	Leicestershire	A. Gibson
Newman Neame Ltd	London	Miss J. M. Emmerson

Perkin-Elmer Ltd	Buckinghamshire	D. Lawrence
Queen's Institute of District Nursing	London	Mrs F. M. Faktor
Robson, Morrow & Co.	London	
Roche Products Ltd	London	A. R. Milne
Rolls-Royce & Associates Ltd	Derbyshire	B. B. Smith
Sheffield College of Technology	Yorkshire	L. G. Tootell
Teleflex Products Ltd	Essex	V. H. Robinson
Thai National Documentation Centre	Thailand	C. Prabhavi-vadhana
Thornber Brothers Ltd	Yorkshire	M. F. Hill
Transcription Centre	London	Mrs D. Speed
Truscon Ltd	London	J. V. Turner
Union Corporation Ltd	London	R. H. Mortimore
United Kingdom Atomic Energy Authority, Reactor Fuel-Element Laboratory	Lancashire	C. T. John
Universal Grinding Wheel Co. Ltd	Staffordshire	W. M. T. Perkins
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INDIVIDUAL

Name	*Locality*
Bradley-Lovekin, R. J.	Wiltshire
Capel, G. A.	Yorkshire
Clarke, D. E.	Herefordshire
Dexter, R. R.	U.S.A.
Dixon, Miss E. J.	Derbyshire
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Gram, N. L.	U.S.A.
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King, Miss C. M.	Nottinghamshire
Kwok-Wah, F.	Yorkshire
McClelland, Dr R. M. A.	Glamorganshire
Orchard, E. L.	Kent
Rao, Mrs U.	London
Sewell, P. H.	Middlesex
Wolff, H. S.	London

A NEW LOOK AT FEATURE CARD INDEXING

A Symposium on Aspects of Practical Application
Summary of Ten Papers and Chairman's Remarks

London, 8th April 1964

Chairman

DR W. E. BATTEN

Head, Central Technical Information Unit, Imperial Chemical Industries Ltd

1. Talk by G. M. Boyd, O.B.E., Lloyd's Register of Shipping

We designed our own hardware and drew up our own word list in a purely empirical way, unhampered by theory. We do not think of our word list as a language, but as a list of descriptive features, a list of only about 450 words, and this we find to be ample. It seems that there is a limit to which the feature system can subdivide a field, and beyond this limit trouble arises from cross-fertilization. The limit, however, is more than adequate for most purposes. If greater subdivision is required it seems preferable to split the larger field into several smaller ones, and to provide a separate set of features for each of these. The general tendency for beginners is to overdo the degree of subdivision. This should be resisted in the interests of efficiency. The essence of the feature system is that it is a method for narrowing down the search; each feature that is used in retrieval divides the field by a factor which may range from about five to twenty or more, so that the convergence is very rapid. In our system we regard the author, source, form, language and country of origin as features. Proper names are also features, so that the system is self-contained, without the necessity of separate author or title indexes.

The heart of any good indexing system is a good indexer, who must have a good general knowledge of the field, complete familiarity with and faith in the system, and a good memory. This applies whatever system is used, and not least to the feature system. After five years' experience we are firmly convinced that the feature system is the best available method, provided that it is sensibly applied, and that users do not expect the impossible of it.

2. Talk by R. L. Ballard, Reed Paper Group's Research and Development Centre

Our joint knowledge and experience with alphabetical indexes and the UDC indicated that we had to use some other kind of information system if our retrieval objectives were to be met. The Unit Concept co-ordinate index employing feature cards appeared to fit our requirements best for the following reasons:

i. There was no earlier system to adapt and we could start from scratch;
ii. Obsolescence and extension of subject coverage would pose no problems;
iii. Simplicity of clerical routines permitted an economic balance of professional to clerical assistance;
iv. Ease of accessibility for the customer.

The feature cards are punched individually when a small batch of abstracts has accumulated. Brisch–Vistem feature cards of 1000-hole capacity were chosen for the working-up and proving periods, but we changed to 4000-hole cards when the system had proved successful. For the larger cards we now use a long-arm hand punch, modified to make 2 mm. holes, and fitted with a magnifying lens and extra illumination at the punching head.

Suggested terms denoting concepts were allocated to each abstract to cater for data as well as for the main subject. When 350 abstracts had been produced the suggested terms were written separately on 5 × 3 in. paper slips, which were sorted alphabetically and scrutinized closely. Synonyms, homonyms and antonyms were brought together under the most pertinent term to the technology, and concepts of little relevance discarded altogether. Each of the suggested terms was discussed and argued before being adopted as a tentative term.

To make the system accessible to the customer, cross-reference slips were introduced for the synonyms, etc., not selected as terms. Terms pertaining to the main field of interest to the company, namely, paper, board, pulp, printing, and packaging of products according to industry, were then grouped respectively in these five classes. Having devised the basic structure of the index the terms were assembled in strip index form in a 9 × 16 in. Kalamazoo S 179 binder, the preferred terms being typed on white slips and the cross-references on buff. Revision of the dictionary of terms was again undertaken when the abstracts accumulation had reached 4,000, 8,000, and 12,000.

The throughput of our system is large and there is a real need for a mechanically aided or semi-automatic locating/punching machine for larger cards. In common with other systems having a large throughput and a low rate of obsolescence, a need also exists for machinery which can read off the numbers of coincident holes and then list them automatically.

3. Talk by R. C. Wright, Royal Aircraft Establishment

The RAE aerodynamics system uses a commercial card with ten thousand punch positions, a well-designed cabinet and a $\frac{1}{16}$ in. punch also commercially supplied. No viewing device is available. The physical form of the index is in fact one of the things we hope to improve.

The present schedules employ 365 terms arranged in sixteen categories (lettered A–P in the summary). One or two of these categories may need some explanation. Category A—Bibliography, for example, covers the date, form, country of origin, type of issuing body and where the document describes theoretical or experimental work. Category L—Aerodynamic interest, provides for such ideas as lift, drag, moments, stability, control, component interference, etc. Some of these concepts are subdivided. Whenever a subdivision is used, the concept of which it forms a part is also coded. Copies of the full schedules are available on request.

Documents are now being added to the system at the rate of 2,500 per annum. The average number of codes used is fifteen to eighteen per document, and it takes about twelve minutes on average to index a document and write the appropriate codes. All relevant codes are included, and indexers unfamiliar with the schedules are advised to use them as check lists. The punching operation takes a further five or six minutes, including selecting the feature cards and filing them in order after punching. It was intended to punch up to nine or ten cards at one operation, but this resulted in some inaccurate punching (the hole diameter is only $\frac{1}{16}$ in.) and six cards at one time is now the limit.

At present input rates a set of feature cards will accommodate accessions for about four years. For a subject such as aerodynamics, which develops rather quickly, this is a convenient interval at which to bring the classification schedules up to date and possibly to adopt an improved physical form of the index.

4. Talk by D. R. Curry, Overseas Geological Surveys

Our system is a specialist one covering a very narrow field and is accordingly indexed in great depth. We have duplicated sheets which give in summary form all the features in the system. An indexer takes a sheet and, after recording the bibliographical details, completes the sheet with a series of ticks after the relevant features and adds codes of authors, etc., as required. The completed sheet is passed to a clerical assistant who removes the specified feature cards. If these already have a concurrent hole the relevant item card is inspected as this will indicate the paper, or an earlier one in a series of papers which is already indexed in the system. If this is so the new form, whether it be abstract or translation reference, is added to the original card. If the item is a new one, however, the next available item number is punched through the pack of feature cards and details entered on the item card. In the case of abstracts or summaries these are dry-mounted on to the cards.

For item cards we use the Shannofan system which you will be able to see in detail this afternoon. This has two main advantages; as a folded card it gives long-term protection to the mounted abstracts—any single card technique (with the exception of machine aperture cards for microfilm) is likely to run into difficulties with abrasion. The system of pockets and signals makes rapid access to a particular card possible.

The feature cards are stored in visible array in duplicate series of different colours. Each card is numbered to indicate the row and position within the row. When the second set is complete (five thousand items) the first set will be put into cold storage and replaced by series 3.

5. Talk by Dr Beryl L. Brady, Brewing Industry Research Foundation, National Collection of Yeast Cultures

On arrival each yeast culture is assigned a number. At present there are over 650 strains in the main part of the Collection and nearly 250 in a specialized section devoted to brewing yeasts, the latter being numbered from 1,000 on.

The system followed in the Yeast Collection is that of J. Lodder and N. J. W. Kreger-van Rij—*The yeasts: a taxonomic study* (North-Holland Publishing Company, 1952). The results of tests on new acquisitions to the Collection are recorded on two pages of a loose-leaf folder under the collection number of the strain. Subsequently the records of these properties are transferred to feature cards, a card for each feature, the 'items' being the individual collection numbers.

The feature-card indexing system has proved to be of more constant use as a record of the results of work done on the cultures in the laboratory from day to day. For instance all cultures are maintained in liquid malt extract and this does not need to be recorded, but over the last ten years we have been preserving the cultures by freeze-drying, gradually working our way through the Collection so that by March 1964 we have reached the 640th culture. Each year in which a group of cultures was lyophilized is represented by a feature card. Four years ago all the cultures then in the Collection were preserved under paraffin oil. This year we subcultured these yeasts into fresh medium and recorded whether they had survived to give vigorous growth or poor growth, had failed to survive or had become contaminated by moulds or other organisms and each of these groupings is recorded on a feature card. Many such treatments are worked through in batches of cultures as time allows and so the results are not entered automatically when a culture is added to the Collection. On cards concerned with such features absence of a punched hole does not mean that the culture is incapable of being freeze-dried, preserved under mineral oil, etc., it merely means that we have not yet had the opportunity to treat it in this manner.

We believe that the National Collection of Yeast Cultures is the only collection of organisms which employs such an index of feature cards, although edge-punched cards are used by other Collections.

6. Talk by R. Snel, Shell International Petroleum Co. Ltd (read by Mr D. S. Longbottom in his absence)

The successful operation and performance of an information unit strongly depend on human relations. Another important factor is the personal appreciation and enjoyment of the questioners in using the system. The speed and functional efficiency of the system works as a magnet and draws people to the Information Division. Apart from the kind and helpful attitude of the information staff involved, it has the practical effect of making the system itself seem kind to the user.

People who have not yet had actual experience with this mostly feel that a word list to cover *their* field of activity must be very long indeed. It is justified, however, to state that such lists (which are not a thesaurus in our case) mostly do not exceed five hundred to seven hundred words or ordinates for whatever field; it also includes five hundred to twelve hundred synonyms or 'secondary words' referring each to the relevant keywords which are listed just in alphabetical order with the rest, but in lighter print.

We have now developed a technique whereby the compilation of a word list for a new field can be done in about eight weeks. Later a number of words are eliminated and some are probably added during the first four to six months of actual use with the new list. We interview each potential user of the unit for not longer than half an hour, and immediately afterwards dictate on a tape recorder the important words used during the interview. These are then transferred to draft loose cards and put in alphabetical order. This avoids duplication of the same words, collected from the other interview. Finally all the cards are carefully analysed again to select the keywords and the secondary words to be related to keywords.

7. Talk by Peter B. H. Gascoine, Spillers Ltd, Market Research Department

The vast majority of the information collected by the Market Research Department of the Spillers Grocery Division is of a commercial rather than a technical nature, comprising items such as:

statistics and estimates of petfood consumption,
articles on trading stamps,
descriptions of the structure of this country's food distribution network, and
lists of useful source material and data.

The system chosen to index this information needs to conform to certain criteria. For instance, it would have to be operated by reasonably intelligent but unskilled staff—a highly trained or experienced staff of librarians is something I do not have nor want particularly. It must cope with a wide range of data; the neatly defined, binary world of, say, the marine engineer or petroleum chemist is entirely foreign to the marketing man.

We began with a custom-built mechanical punch and a set of 250 plastic feature cards, each provided with ten thousand numbered positions. Initially we started off with an alphabet or dictionary of one hundred features that were thought desirable. Although at the end of the first ten weeks operation we found that this number had grown to 123, it is likely that we have tended to provide too many rather than too few features. This is a tendency noted by other users of the feature card system. For example, we find that of these 123 features twenty-four carry over a third of the traffic and thirty have been hardly used or not used at all.

So far as the number of features per item is concerned we have found there is a wide scatter about the mean. In some cases, only two features are itemized, whereas a few cases have occurred in which as many as eighteen features have been used.

8. Talk by R. Williamson, Chiswick Products Ltd

We had already had experience of two 'conventional' feature-card systems in the Chiswick Products Laboratory and we had had some difficulty with confusion of synonyms—this we wished to avoid when setting up the new abstract indexing system.

We had no wish to introduce feature cards which might be used only a few times in five thousand items yet every description had to be recoverable. The speaker's solution is by multiple use of the feature cards; combining them in pairs and using each 'pair' as a feature card. An article on this method as used in the Technisch Documentatie–en Informatie–Centrum voor de Krijgsmacht at The Hague appeared in the *Journal of Documentation,* vol. 18, no. 12, 1962, p. 176–82.

Each descriptor is allocated a code in the form letter–number–letter,
e.g. A2Z, F3P, Y2N, etc.

Each of these codes corresponds to a pair of feature cards,

e.g. A2Z uses cards A2 and 2Z
F3P uses cards F3 and 3P
Y2N uses cards Y2 and 2N

and the pairs are punched and handled together. The codes used omit I and O to prevent possible confusion with 1 (one) and 0 (nought) and six series numbered 1 to 6 are used.

For ready reference the feature cards are divided into two series:

i. A letter-number series
e.g. A2, F3, Y2, etc.

and *ii.* A number-letter series
e.g. 2Z, 3P, 2N, etc.

Each series consists of 6 × 24 = 144 cards giving a total of 288 cards. Combination of these two series gives 3,456 possible pairs and hence descriptors. The allocation of codes is made as random as possible and the speaker has made a Random Code Generator for this purpose. Lists are kept correlating those codes which have been used, etc. The number of false drops obtained in use is surprisingly small since no one has, so far, ever asked for information based on less than three descriptors. A rough check on our present system has shown an average of 10 per cent false drops for one descriptor pair, but, as this is a multiplying factor, the use of three descriptors gives a theoretical false drop of only 1 in 1,000.

9. Talk by Dr I. Sandeman, English Editor of the DMS (Documentation of Molecular Spectroscopy) Index

We use peep-hole cards for literature retrieval. In this case the numbered spaces on the peep-hole card do not represent the serial numbers in a card pack, but numbered entries in a literature list. We issue a literature list in quarterly batches of about six hundred entries, each batch with its own IBM peep-hole pack with six hundred numbered spaces. This means that in two years' time eight quarterly batches, each with its own small peep-hole index, will have been collected. These will be accumulated on large peep-hole cards. The result will be that ultimately the whole of the relevant technical literature will be searchable in blocks of two years.

An ordinary unnumbered literature list is a very effective way of bringing new work in his field to the notice of the research worker. It is of very little use for the purpose of tracing back literature. Yesterday's literature soon hurtles into the past, and is lost in the immense accumulation of technical literature like a needle in a haystack. Professor Kaiser says about peep-hole cards: 'I believe that two things cannot be over-emphasized, namely that the peep-hole cards really solve the problem of making a "polydimensional register" at moderate cost.' I think this is a good way of expressing the facts of the case. The second is that combinations of questions can be answered quickly and without expensive desk apparatus. Sorting is actually quicker than with the help of an IBM sorting machine, if time lost until the machine is free, time for programming, etc., are taken into account. Comparison of our system with the most modern computer systems (magnetic storage tape, etc.) makes one reflect that the use of such expensive equipment for answering simple questions (when waiting time and operating time are taken into consideration) is quite unprofitable. This is what is often overlooked in discussions with people who are 'electronics crazy'.

10. Talk by H. F. Dammers, Woodstock Agricultural Research Centre

Feature card systems are extremely powerful retrieval devices, but serious drawbacks can arise when the system becomes large in size. We will try to avoid these drawbacks by adhering to the following desiderata:

a. The codes (descriptors, keywords, etc.) used should be carefully selected and their relationship well defined.
b. There should be freedom to add new codes when required.
c. The feature-card set should remain relatively small in size (300–500 cards).
d. It should be possible to search large collections (say 100,000 documents and over) without having to search through multiple sets.
e. It should be possible to extend the coding of documents already entered in the sets or to reproduce the feature-card set without undue difficulty.

The subject codes, consisting of five digits, are generated by our manual indexing system in which their generic relationships are fully established.

In order to avoid having the unmanageable number of cards which would result from using one card/feature, we use a type of superimposed coding requiring four sets of cards each numbered 00–99. Any subject code is broken up into 4-overlapping 2-digit numbers, e.g. 0.75.31 would become 07.75.53.31. The relevant cards from each of the four sets are then punched in the position corresponding to the document number. With this system 400 cards (4 × 100) can cope with 100,000 subject codes.

This method of superimposed coding is similar to the 'quartet-key coding' described by Schön, *Nachrichten für Dokumentation,* Jg. 11, 1960, p. 142–6. Instead of typing out for each document a document card with bibliographical details, subject codes, etc., we enter this information direct on to IBM punched cards. The key-punching effort involved, using an IBM 026, is roughly equal to that for ordinary typing. Once it is available on IBM cards the reference can be mechanically typed out whenever required and it can also be processed via the computer to produce bibliographies arranged according to subject, etc. The punched-card data are fed into the computer at two-weekly intervals and we can programme the computer to process the subject-codes and provide us with a list of instructions indicating the positions which have to be punched into each successive feature-card in order to enter the two-weekly batch of documents.

The information listed might read:

A 02 Row: 17 Column: 16 25 43 62 81 98
Row: 18 Column: 5 39 65 79 93

This information can then be entered by placing the relevant feature card, in this case 02, in set A (there are 4 sets A to D) in equipment such as the Jonker 301 and moving the drill from position to position according to the above instruction.

Equipment is now available commercially to up-date and reproduce feature card records mechanically and to miniaturize them when sets become very large.

GENERAL DISCUSSION

Dr W. E. Batten, from the chair, opened the discussion by saying that there appeared to be a fairly widespread impression that there were 'rule books' for the compilation of key-word vocabularies. He offered the opinion that this was not so and that it was unlikely to be so. To a large extent a key-word vocabulary was a personal and parochial thing and was likely to be the better for being composed with a strict eye on the *local* requirements—preferably local requirements as demonstrated in a good sample of questions, rather than local requirements composed from theoretical considerations. He added, however, that there must be to date a considerable body of practical experience of vocabulary construction and that, given a convenient form for sharing and discussing that experience, it was probable that a number of guiding principles, coming near to a 'specification' for a key-word, might possibly be drawn up.

Summing up, the Chairman said he thought that the lessons of the Conference might be expressed under two heads:

Equipment Good as had been the equipment seen at the conference display, it had nevertheless been clear that if feature card indexing is going to acquire a wide appeal for the busy and large collection some further mechanization is urgently required, more especially at the output end. He suggested that one possible target for the equipment people should be an automatic screening device which would note the coincident holes on an assembly of feature cards and, for each coincident hole, generate a signal of some kind which would either print the relevant number on a slip of paper or, better, control a running reel of microfilm so as to present a sequenced array of microfilm abstracts without the intervention of the error-ridden human hand.

Philosophy He said that there had been a common theme running through the more sophisticated papers heard—namely a desire to 'compress' a relatively large vocabulary into a relatively small number of feature cards by cross-coding of various kinds. This seemed to be a most interesting development which deserved independent study, since it obviously opened the way to economies, albeit at some sacrifice of precision. This led him to conclude with the observation that some of them might find their mission a lot easier to approach if their creed had been called in the first place 'information extraction' rather than 'information retrieval'. It was much too late to try and change the terminology, but there was little doubt that the process was one of extraction rather than retrieval and that the part which they were trying to mechanize and cheapen was the step of setting aside that part of the collection which need not be read at all. Personally he doubted whether it would ever be feasible to dispense entirely with true intellectual effort in the final output stage.

MECHANIZATION IN DOCUMENTATION
The Ministry of Aviation Technical Information and Library Services

H. F. VESSEY, B.Sc., F.R.Ae.S., M.I.Inf.Sc.
Assistant Director, Technical Information and Library Services

Aslib Electronics Group Conference, Ashridge, 5th–7th June 1964

1. *Introduction*

For some time an investigation has been proceeding on the benefits to be gained by mechanization of the report handling procedures of TIL with a view to computer 'retrieval'. A small working party of representatives of TIL and the Organization and Methods Branch meets regularly to discuss progress and outstanding problems.

The following paper discusses the general problems of mechanizing a Document Centre, describes the work to date in TIL and indicates the author's views on future possibilities. These views are tentative only and it cannot be assumed that they will be accepted by the Ministry of Aviation. Much hard work has been put into this investigation by members of TIL, O & M and the Aslib Aeronautical Group and the author is grateful for this opportunity to express his appreciation.

Some minor mechanization has been introduced into TIL which does not fall under the general heading of computers. This should, however, be of interest to small documentary units and has therefore been included.

2. *The need for mechanization*

The stage of growth at which an organization should consider mechanization is difficult to define because of the very wide spread in subject fields and in activities such as the issue of abstract bulletins, printed indexes and lists. Such activities, to which may be added 'Field of interest register' and security and stock control, will be termed 'business activities'. Except for the very largest collections it is the author's contention that 'business activities' rather than retrieval determine the case for mechanization. This was certainly true in the case of ASTIA (now Defense Documentation Center) and it will be shown later that it applies to TIL.

Business activities vary widely and do not depend primarily on the size of the collection. They must be judged on their merits and fortunately the effort involved can be assessed reasonably accurately. Retrieval, however, is another matter. This will be discussed later but—as an indication—in TIL with a collection of nearly half a million single titles retrieval is not yet a major problem.

The paragraph above refers to full-scale mechanization with computer operation and it would be unfair to neglect to mention some of the many mechanical aids which are now available, some of which can be of value to the smallest units.

3. *Mechanical aids*

The number of mechanical aids suitable for use by librarians and information officers is increasing rapidly, but only a few can be mentioned here. Those in charge of even the smallest unit should certainly keep in touch with new developments.

3.1. *Punched card sorters.* Punched card sorters of the Hollerith or IBM type can be used in an information unit, the main limitation being on the amount of information (a basic maximum of eighty letters) which can be punched into one card. The literature describes many uses including retrieval. In the author's opinion retrieval is not an attractive application because of the limitation on the information on the one card and the need to sort through the whole collection each time.

An interesting application is the use of a miniature punched card (Powers-Samas, now ICT) by Holborn Public Library for book charging.[1]

The O & M Branch of the Ministry of Aviation have undertaken the preparation of a Specifications Index for TIL. This Index is required to be revised and reissued periodically but the amendments and additions, although important, are not many. Once a set of cards has been punched the additional or revised can quickly be sorted into the pack and a machine print supplied. With the present equipment the type face is limited and the result is not elegant. For the specialist user, however, it is adequate. (Figure 1.)

```
LENS 6 INS F 6 PT 3 WIDE ANGLE        PM 344    2  2 IAP RAE
 SURVEY 9 INS BY 9 INS FOR AIR
 SURVEY CAMERA
LENS 7 INS F 5 PT 6 FOR TYPE 5        PM 312    1  2 IMP RAE
 ENLARGER
LENS 8 INS F 2 PT 9 FOR CAMERA        PM 110    2  6 WILLIAMSON
 AIRCRAFT TYPE F 24
```

FIGURE 1

Sample from specification list

3.2. *Card sorters.* Less well known is the use of sorters to arrange index cards. In TIL a breathing space has been gained by obtaining a Keytronic sorter. With fifteen packs of eight hundred cards to sort every fortnight into six indexes, hand sorting can be described as slave labour. The Keytronic sorter improves the speed of sorting by a factor of 1.3 and in addition makes the work more interesting. It is a simple mechanical device with a typewriter keyboard. When a key is struck the top card of a pack is lifted by a suction head and directed into the appropriate pocket. Pockets are lettered from A to Z with an additional discard pocket. The first ten are also numbered 0–9 so that numeric sorts are possible.

3.3. *Flexo-print.* Remington-Rand Flexo-print is well known and will not be described. It is a method of reproducing listings and is particularly valuable when re-arrangement or the addition or alteration of a few items is required periodically. It is being used in TIL with Dual rite to produce the authority list, that is the list of the originators of reports in a standardized form. Dual rite allows heavy and light type to be obtained on a normal typewriter to distinguish between preferred and possible descriptions.

Flexo-print is easy to re-arrange or correct and is very suitable for lists which have to be brought up to date periodically. Its use compares with the Specification Index operation already described, and although probably more expensive it produces much better copy. (Figure 2.)

088000	ARS	**American Rocket Soc., New York, U.S.A.**
139500		**Arsenal de l'Aeronautique, France.**
100500	ART	**AR&T Electronics Inc., Little Rock, Ark., U.S.A.**
		Arthur D. Little, Inc., Cambridge, Mass., U.S.A.
140000		**Artrite Resins Ltd., Camberley, Surrey, U.K.**

FIGURE 2

Sample from originator list

3.4. *Tape-typewriter.* The tape-typewriter consists of a normal keyboard with mechanical or electrical connections to a punch. For the first operation it is used as a normal typewriter but at the time of typing the punch cuts signals into a paper tape. The paper tape can subsequently be transferred from the punch to the reader and then, by throwing a switch, the operator causes the typewriter to retype, in the same form, the original text. The rate of retyping is roughly only twice that of a good typist and it therefore cannot be used for quantity production. The copy should, however, require no detailed checking. Further, it is possible to retype part of the text recorded on the tape, switch off the reader and type manually. During the reading of the tape and the subsequent manual operation it is also possible to cut another tape.

If a second reader is available, and with some limitations with only one, it is possible to programme the first typing so that in producing, for example, index cards all the items appear at the same place. For computer operation it is also possible to programme so that the signals required for identification and separation are punched into the tape.

A more detailed description of the process and coding of the TIL operation is given in references 2 and 3.

Most tape readers will accept edge punched cards, which, in effect, are cards with tape punching along one edge and the translated text on the remainder. A possible application in TIL is for originators which, in a mechanized system, must always be in the same form. A set of cards is punched and verified and is held by the typist. The analyst indicates by number the appropriate originator and when the typist comes to the originators space on the abstract card she draws the card and inserts it in the reader. Originators will then always be typed in the desired form (which may not be that on the report itself).

Finally it should be said that correction of tapes, although possible, is expensive and that accurate typing in the first case is essential if full benefit is to be derived.

A tape-typewriter can be used for routine library operations by typing a master tape from which multiple catalogue cards can be typed automatically and the tapes also used to prepare an Accessions List. An experiment carried out in TIL is reported in reference 4, but it was found that saving in checking time was counterbalanced by the problems inherent in handling the many short lengths of tape.

4. *The TIL operation*

One of the main tasks of TIL is the control of the unpublished report literature for the Ministry, its contractors, other Ministries, and foreign documentation centres. It also serves universities and to a lesser extent industry generally.

The stock of reports is close on half a million single titles and is growing at a rate of about thirty thousand per year. Reports from Ministry of Aviation Establishments, from other Ministries and from universities and abroad are circulated to those known to be interested and are notified to a wider circle by *R & D Abstracts.*

R & D Abstracts is produced twice monthly and contains abstracts of all (or nearly all) reports received in TIL from all sources in the intervening period. Reports are indexed by the Universal Decimal Classification (UDC). Because of security considerations more than one version of each issue must be produced.

The presentation of the abstracts is such that the same stencils can be used to produce index cards. Copies of each card (approximately thirteen thousand in all) are supplied fortnightly to TIL and these are sorted and distributed to six indexes.

R & D Abstracts contains only a broad subject index which is not cumulated; all searches have therefore to be made in the card indexes. Requests for report literature come in all forms, by R & D Accession number (the only one which does not require a search), by one of the actual report numbers (there may be four on one report), by title, originator (of which there may be three for a single report), author or contract number or finally by subject. All the searches except the last are regarded as clerical operations, but the subject search is done in the UDC card index by a subject specialist. It is only this latter search which is generally described as 'retrieval' in the literature.

Bibliographies are prepared on request and in certain areas are kept up to date by reissues. They are compiled by subject specialists after a subject search.

5. *The case for mechanization in TIL*

Retrieval is not a major problem since the UDC Index when used by subject specialists is adequate, although it will not continue to be so much longer. The problem of sorting and putting the new cards in the right place in the five other indexes is, however, an acute one not only from the numbers involved, but because the work is dull but must be done correctly. One of the aims, therefore, is to abandon card indexes and to replace them by printed indexes.

TIL's customers have always pressed for adequate indexes to *R & D Abstracts* and the provision of these could save much work at Establishments although the effort of producing them manually is quite prohibitive. The aim, therefore, is to machine print indexes which will be cumulated periodically. Not all the indexes will be of interest to Establishments and probably three will be reproduced and distributed to TIL's customers. A complete set of up-to-date indexes will be required in TIL for 'clerical' searching and it may well be that the machine print-out will be adequate for this purpose, particularly if legible carbon copies can be produced.

Many lists of reports are produced in TIL for various purposes and most of these could be very simply produced by a simple computer search and print-out.

With subject retrieval much of the effort of compiling bibliographies would be avoided and the process considerably speeded up. Again there is the possibility of setting up a Field of Interest Register defining customers' interests in particular subject fields. Some selective dissemination is already done but machine processing could considerably increase it to the benefit of individual scientists.

Finally there is the possibility of editing and producing R *& D Abstracts* by computer.

6. *The present position*

Minor mechanization in TIL has been mentioned in Section 3 and the work with card sorting for the Specifications Index* and with the Flexo-print for the Authority List will continue. An important step which could lead to full automation has, however, been taken in the purchase of one tape-typewriter and the ordering of three more.

Two issues of R *& D Abstracts* have been produced by tape-typewriter.[5, 6] The first was purely experimental, but the second was done as far as possible under operational conditions. A programme tape was used (Figure 3) to give uniform spacing and to insert 'non-print' computer symbols. These symbols are reproduced at the first typing (Figure 4) but on typing back (reading) they are normally suppressed (Figure 5). On the TIL machine, however, printing at will was specified for checking purposes.

Abstracts were sent to the editor who arranged them in order and allocated the main subject headings for the very simple R & D Index. The tape-typewriter operator, using the programme tape, typed the abstracts and added to each a consecutive 'location number'. The copy was then checked and the tape was read back to cut a wax stencil, errors being corrected at the same time. R *& D Abstracts* was then run off and circulated.

The tapes† were then passed to IBM who had offered to do an indexing experiment with existing programmes. Two indexes, an author and a report number index, were processed on an IBM 1011 tape reader and the IBM 1401 computer installation. The results[7] were very encouraging and the mixed alpha-numeric sort required for report numbers introduced little difficulty (Figures 6, 7). There were certainly errors, but these were minor and it is clear that they could be removed by better editing and by a more sophisticated programme including error detection.

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* This has in fact been discontinued. Changes of Departmental Titles at RAE necessitated so much repunching that effort could not be made available. Flexo-print will now be used.

† The tapes used were in fact second generation tapes punched while reading back the first tape for stencil cutting. A slightly modified programme was used to suppress the abstract and so avoid unnecessary computer reading time.

```
▽▽▽[]      ▽▽   ▽▽                            ▽▽ UNCLASSIFIED
▽▽
▽▽
▽▽           ▽▽   ▽▽   ▽▽
▽▽     Contr.   ▽▽   ▽▽ Proj.                 ▽▽
▽▽
▽▽     UDC.
▽▽




▽▽▽▽

▽▽ ▽     (Continued)
```

FIGURE 3
Programme tape

```
▽▽▽[019]  P117051   ▽▽     ▽▽  AMRL TDR 63-35               ▽▽ UNCLASSIFIED
▽▽           Ohio State Univ., Aviation Psychology Lab., Columbus, U.S.A.
▽▽        THE RETENTION OF DISCRETE AND CONTINUOUS TASKS AS A
          FUNCTION OF INTERIM PRACTICE WITH MODIFIED TASK EEQUIRE-
          MENTS
▽▽           Brown, D.R.   ▽▽ Briggs, C.E.   ▽▽ May 1963   ▽▽ 18pp., 8ref.
▽▽        Contr. AF 33(616)-7269  ▽▽ FR   ▽▽ Proj. 1710             ▽▽
▽▽
▽▽        UDC. 159.953
▽▽        Laboratory research is reported on retention of continuous (tracking) and
          of discrete (procedural) tasks as a function of rehearsal conditions
          (simplified versus "operational" rehearsal tasks).   All rehearsal con-
          ditions led to superior retention of the tracking task comparec to a no-
          rehearsal condition, and certain of the procedural task scores indicated
          the same result.   However, little evidence was found to indicate
          reliable differences among the several rehearsal conditions.
▽▽▽▽
```

FIGURE 4
First typing of abstract

```
[019]     P117051            AMRL TDR 63-35                   UHCLASSIFIED
             Ohio State Univ., Aviation Psychology Lab., Columbus, U.S.A.
          THE RETENTION OF DISCRETE AND CONTINUOUS TASKS AS A
          FUNCTION OF INTERIM PRACTICE WITH MODIFIED TASK EEQUIRE-
          MENTS
             Brown, D.R.    Briggs, C.E.    May 1963    18pp., 8ref.
          Contr. AF 33(616)-7269    FR    Proj. 1710

          UDC. 159.953
          Laboratory research is reported on retention of continuous (tracking) and
          of discrete (procedural) tasks as a function of rehoasal conditions
          (simplified versus "operational" rehearsal tasks).   All rehearsal con-
          ditions led to superior retention of the tracking task comparec to a no-
          rehearsal condition, and certain of the procedural task scores indicated
          the same result.   However, little evidence was found to indicate
          reliable differences among the several rehearsal conditions.
```

FIGURE 5
Retyping of abstract

```
BUTLER         H.S.      PLASMA SHEATH FORMATION BY RF FIELDS                                117  CRB 63/1704
BUTTERWORTH    G.A.M.    FURTHER DEVELOPMENT OF AN AUTO DEPLOYABLE FACE MASK  SYSTEM         384  P116859
BWNDOR         E.        FLOW REGIMES FOR HYPERVELOCITY VEHICLES                             092  P117010
CAFFREY        R.W.      RATE OF RED CELL FORMATION IN RATS AT 24DEG.C AND AT 5DEG.C         225  P117077
```

FIGURE 6

Machine print-out of author index

```
AD 283529 TAB        291  CRB 63/1611          AD 284270 TAB        346  P117390
AD 283531 TAB        217  P117137              AD 284271 TAB        065  P117144
AD 283539 TAB        214  P117156              AD 284275L           318  P117063
AD 283542 TAB        307  CRB 63/1612          AD 284291 TAB        143  CRB 63/1706
```

FIGURE 7

Machine print-out of report number index

7. *The future*

In speaking of the future the author emphasizes again that the views expressed are his own and will not necessarily be accepted by the Ministry.

7.1. *Printed indexes.* When the three additional tape-typewriters, now on order, are supplied it should be possible to produce R *&* D *Abstracts* regularly on them. With some reorganization of procedures this should reduce effort and cost but the primary purpose is to produce tape. It is intended that these tapes shall be computer processed to produce indexes. A subject index may not be possible in the first case but the other 'clerical' indexes should be started immediately. Regular cumulation will be required and it will be necessary to consider the number of indexes to be printed for circulation to customers and the degree to which these are cumulated. At this stage no further cards will be added to the existing card indexes although they will still be in use for older reports.

For this operation it is anticipated that computer time will be hired for the simple tape processing and sorting operations required.

7.2. *Location number.* The location number device used in the experimental run will be adopted. This has many advantages as from an index it gives direct access to the abstract as distinct from the NASA or DDC procedure in which the index directs the customer to an area in the abstract journal. The location number will also be the 'machine' number for all computer operations. The simple system of a three-figure number used in the experiment must be expanded to direct the customer to the right issue of R *&* D *Abstracts* and the proposal is to use an eight-figure number defining in order: year, issue number of that year and abstract location number. The location numbers will run consecutively through one issue and will be allocated in blocks to the unclassified and classified versions of R *&* D *Abstracts.*

7.3. *The subject index problem.* The UDC system even as used by TIL is considered unsuitable for machine retrieval as the description is not sufficiently detailed and co-ordination is not usually possible. The author's opinion is that any index will work manually with, say, ten thousand documents but that it must be more carefully prepared as numbers increase. At the same time machine retrieval will be difficult with even ten thousand documents if the index is not better than most we now know. The difference is due to the fact that machines do not think.

In considering the index problem the magnitude of the task of compiling an index to cover Ministry of Aviation interests was frightening as it was known that ASTIA spent twelve man-years on their first edition. However, offers of co-operation with DDC—formerly ASTIA—and of assistance from the Aslib Aeronautical Group's Working Party on Indexing came at an opportune time. The 'Thesaurus of ASTIA descriptors' 2nd edition is now being carefully considered by the Group and a number of descriptors have already been accepted by DDC for the next edition. The advantage of using the ASTIA Thesaurus is twofold for not only is the work of producing the index greatly reduced but in addition about one-third of the intake of reports will already be indexed by DDC.

Indexing of the reports will start as soon as possible and for a time will be done parallel with UDC indexing for which cards will still be filed. When a collection of some five thousand reports have been indexed some experimental work will probably be started, but full computer operation on subject retrieval will clearly be uneconomic until the collection has grown considerably.

It is thought that the index terms are of value to some studying the abstracts and it is proposed to print them in *R & D Abstracts*. This has the advantage of giving a readily available permanent record, an essential if indexing is to be kept consistent.

7.4. *Retrieval.* The preparation of printed 'clerical' indexes will result in (probably) magnetic tapes which will be periodically re-run to bring them up to date. The tapes will clearly be suitable for searching but in the initial stages search of the printed indexes should be adequate. Later when there is ready access to a computer 'clerical' searches will be considered again. They are most likely to be attractive if they can be combined with a 'need-to-know' search.

Subject retrieval should start as soon as sufficient abstracts are available on tape. The form of the subject retrieval tape, drum, disc or pack requires further consideration. It will consist of a store of the report location numbers associated in each case with the appropriate descriptors. One of the decisions to be taken is the form of this store. It can be normal ordering i.e. report location number followed by the appropriate descriptors (say, average twelve) or it can be in the 'inverted' form with each descriptor (probably in alphabetical order) followed by all the location numbers to which it has been allotted. The latter is analogous to 'peek-a-boo' and has the advantage that only part of the store requires to be searched. It does, however, require 'random access' to show maximum advantage. The advantages and disadvantages appear to be fairly equally balanced and are tabulated on p. 349.

8. *Other possibilities*

Paragraph 7 deals with the primary reasons for computer operation and it is now intended to discuss other functions which could be performed, some of which could show substantial advantages or savings.

8.1. *Field of Interest Register.* Selective circulation of reports is already done, on a small scale, in TIL by recommendation of the subject specialist. This

	For	Against
Direct coding *Location number* followed by descriptors applicable (10–15)	Simple up-dating Date segregated Easy to print-out all descriptors	Must search whole collection unless date segregation is possible
Inverted coding *Descriptor* followed by location number applicable	Much shorter search particularly if random access is available	More difficult up-dating Not date segregated but search could be date segregated by limiting on location number *Search* index terms only easily printed out

could be extended to a mechanical retrieval operation if the customers' field of interest could be sufficiently well described by the Thesaurus Index terms. A tape would then be prepared linking customers and index terms and would be fed in as an inquiry at appropriate intervals.

8.2. *Need-to-know.* Need-to-know tapes defining security clearance for certain areas of knowledge are used in the DDC system and should certainly be considered for TIL. The difference between American and English circulation procedure makes it less attractive for normal use but if Field of Interest Register became operational the two could well be combined with considerable advantage.

8.3. *Printing abstracts.* In the initial stages of the operation on retrieval it will probably be necessary to accept, as an answer to a subject inquiry, a set of report location numbers. This can only be a stop-gap and the minimum information that is informative would be a print-out of bibliographic data. Much searching time would be avoided by printing out the whole abstract and this should certainly be the final aim, requiring of course upper and lower case printing. Printing time is, however, expensive and, since an unduly wide question could produce some hundreds of reports, an initial check seems desirable. This could be a printing out of the number of reports answering to the question. This argument appears to lead to a recommendation for off-line printing of abstracts.

8.4. *Printing* R *&* *D Abstracts.* The complete preparation and printing of R *& D Abstracts* by the computer is very attractive and could save much effort. The operation might then be as follows:

a. Abstracts are prepared as they are received and paper tape punched in random order.
b. Every two weeks the tapes are fed to the computer.
c. The computer then sorts by a Security marking into the appropriate part of R *& D Abstracts.*
d. Within the parts the next sort is on a broad subject order.
e. Subject headings are then inserted and within each part a sequential 'location number' is allotted.
f. Finally page number, page arrangement and print-out in upper and lower case.

This operation will give finished copy which will require only photographic reproduction before printing. As described the operation will probably require a storage capacity well above that of most computers. All the initial sorts can, however, be done on a small fraction of the information in the complete abstract and it is thought that, perhaps by allotting a sequential input machine number temporarily, the sort could proceed on a limited amount of data. Again off-line print-out appears to be indicated.

8.5. *Index refinement.* As a check on the use of the index regular computer runs should be done on the allocation of descriptors to reports. In its simplest form it will indicate the usage of each descriptor in the intervening period and so give a warning by very high or very low usage. Cumulative totals will perform the same function and will provide subject specialists with an indication of the number of reports available under broad headings. It is hoped that it will also be possible to do a little research on the association of descriptors to allow of further refinement of the index and to aid the formulation of search procedures.

9. *Problem areas*

Some of the areas in which further investigation is required are discussed below:

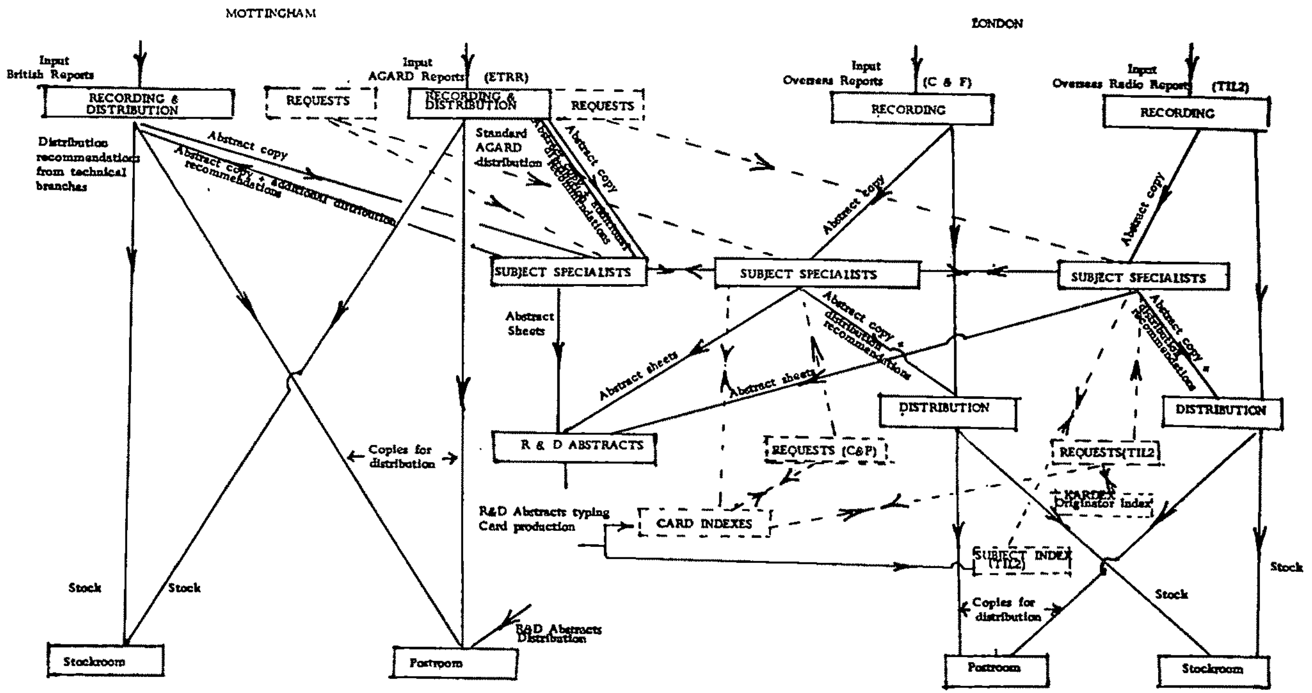
9.1. *Work flow.* The present work flow, Figure 8, is flexible, works well with a manual system and is not unduly affected by delays due to sickness or leave. With a largely automated system, however, the real advantages cannot be realized unless the work flow is steady and continuous without delays. A possible flow chart is shown in Figure 9 but this requires further investigation.

9.2. *Old reports.* There appears to be little possibility of indexing and processing old reports and it will therefore be necessary for a time to search both by machine and by the present card catalogues. A compromise which may be considered would be to index old reports which are requested on loan or are included in bibliographies as this would give some indication of value.

9.3. *Index terms.* As already mentioned it is desired to print-out the indexing terms (say, ten to fifteen per report) in R *& D Abstracts.* Thus they will appear on the paper tape in plain language. For machine operation there is no doubt that a fixed field length code number would be preferred but to provide

FIGURE 8

Document flow diagram—present system



this a separate number punching operation would be required. This is the type of slave-labour which the author is striving to avoid and an investigation of the problems of feeding the computer with plain language descriptors is required. To give an idea of the difficulties a sample of the types of descriptors is given below:

Roll
Stability (lateral)
Stability (longitudinal)
Swept—forward wings.

In the search store inverted coding would show a major advantage as each descriptor will appear once only, presumably in alphabetical order to allow of random access.

9.4. *Machine storage.* Investigations of the temporary and permanent machine storage required are in the very early stages but a few tentative figures are given below.

9.4.1. *Permanent storage.* The primary permanent store will be the 'master' store containing the full text as reproduced in *R & D Abstracts.* This will be arranged in location number order and will only be modified by adding to it sequentially. Random access will be required to allow of print-out of the abstracts selected by a search. Some 120,000,000 characters of storage appear to be required for 150,000 reports corresponding to five years intake at the present rate.

The second store is the retrieval store and here, with an average of twelve descriptors per report, the storage required will be about 12,000,000 characters for the same period for both direct and inverted filing. Random access will be required if inverted filing is used, but this store will have to be regularly up-dated by adding new reports to the appropriate descriptor headings.

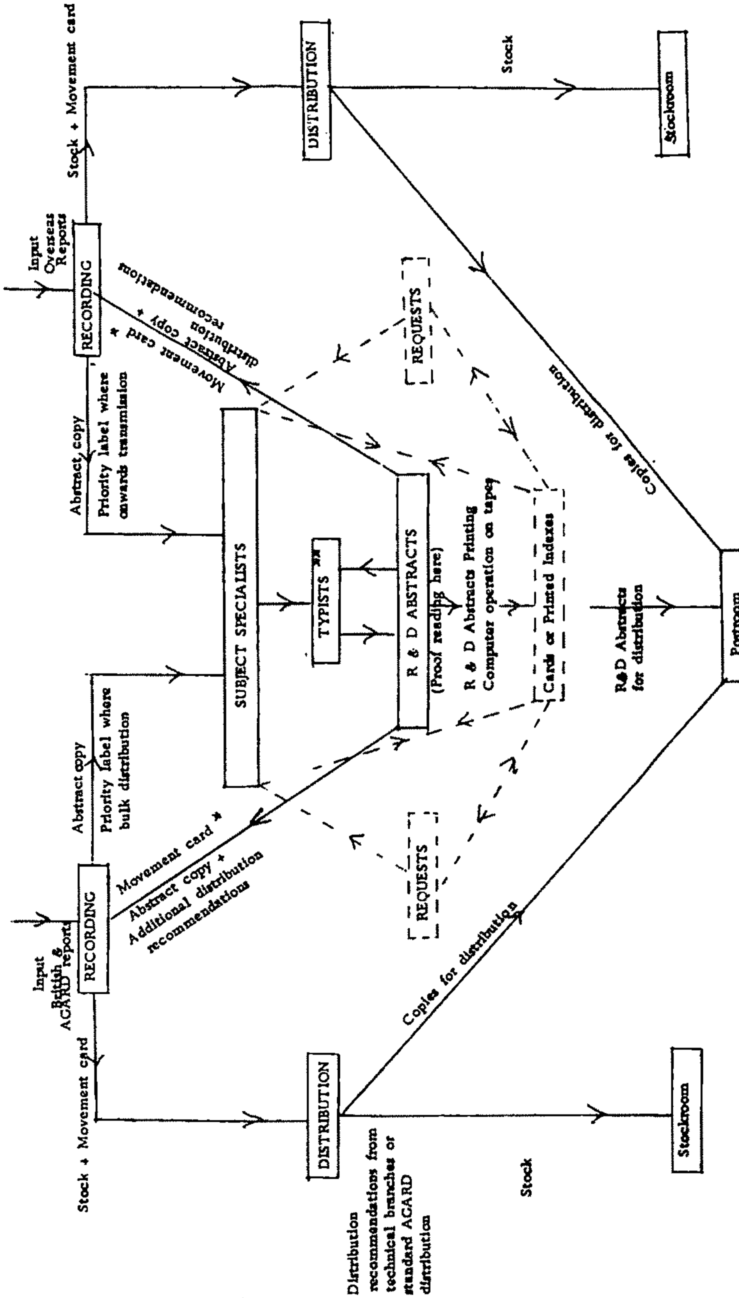
Probably five other stores, some of which might well be magnetic tape, will be required corresponding to the indexes which it is required to print. These again would have to be up-dated regularly, in most cases by a simple sort.

9.4.2. *Temporary storage.* Search is likely to require more storage than other operations, but the author's knowledge of machine practice is insufficient to give any clear indications of the internal stores that will be required. However, a simple search for a single question might well take the following form.

The question will be translated by the subject specialist into a combination of, say, three to five descriptors. The search will be for all reports to which all the descriptors apply. The computer will locate the first descriptor and read and store all the report numbers to which that descriptor has been applied. It will then turn to the next descriptor, compare the report numbers with those in store and erase from store those which are not in common. The process is repeated with the other descriptors, the store of report numbers being reduced each time. The result will then be printed out or used as described earlier, to print-out actual abstracts. Clearly some economy in storage can be obtained by intelligent ordering of the descriptors, placing those which are specific and therefore likely to produce few report numbers first. At a reasonable guess, storage of 10,000 characters might be required

FIGURE 9

Document flow diagram—proposed system


Input Overseas Reports
RECORDING
Stock + Movement card
DISTRIBUTION
Stock
Stockroom
Movement card * Abstract copy + distribution recommendations
Abstract copy
Priority label where onwards transmission
REQUESTS
SUBJECT SPECIALISTS
TYPISTS **
R & D ABSTRACTS (Proof reading here)
R & D Abstracts Printing Computer operation on tapes
Cards or Printed Indexes
R&D Abstracts for distribution
Copies for distribution
Postroom
Abstract copy
Priority label where bulk distribution
Movement card * Abstract copy + Additional distribution recommendations
REQUESTS
Input British & AGARD reports
RECORDING
Stock + Movement card
DISTRIBUTION
Copies for distribution
Stock
Stockroom
Distribution recommendations from technical branches or standard AGARD distribution

** Movement card is typed as carbon copy simultaneously with typing of abstract

* Movement cards for priority reports are returned to Distribution on same day.

to provide the answer to this single question. This, however, would almost certainly not represent good computer practice and the desire would be to process, say, ten questions simultaneously, requiring 50,000 to 100,000 characters of storage.

9.5. *Time of search.* The time required to make a subject search will be of major importance in relation to the economy of the operation. As described above the actual times of search appear to be of the duration of a few minutes (or even seconds) only, but this is in conflict with what is known of other operations. Thus DDC was said to be taking eight hours to make fifteen searches of some 200,000 documents, and Western Reserve nearly seven hours for five questions on 85,000 abstracts. There are good reasons why both these times should be greater than a TIL operation, but clearly time of search requires careful investigation. If printing out of abstracts is required, as the author firmly believes, there will clearly be inconsistency of time between search and print-out and off-line printing will be indicated.

10. *Concluding remarks*

From the work done to date and the consideration of possible future operations the author is convinced that computer operation of TIL's documentary activities is not only possible but would show major advantages. These advantages might well show no direct financial saving but would certainly allow staff of comparable numbers to produce much larger output with increased services to the customers in the Ministry, in industry and the universities.

A matter yet to be discussed is whether TIL should have its own computer or should use time on, say, one at an Establishment. While the documentary activities are probably unlikely to require full-time operation they will certainly call for regular dated periods of complete availability and it may, therefore, be difficult to fit in with another major user.

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have an immediate vacancy for an experienced Abstractor with good German and preferably some Russian, to assist the Information Officer in the preparation of Technical, Commercial and Patent abstract bulletins covering: Fuel, chemistry and chemical engineering and the food industry. Preferred age 25–35. Minimum qualification: 'A' level chemistry and physics (or equivalent). Experience in answering inquiries and other aspects of information work together with membership of the Institute of Information Scientists would be an advantage.

Applications, in writing, should be addressed to:

Personnel Officer, Simon-Carves Ltd., Cheadle Heath, Stockport, Cheshire, quoting ref. SC.66/3.

LIBRARIAN

Applications are invited for the position of Librarian (female) to a large firm of Chartered Quantity Surveyors in the London West Central area. The applicant will be required to initiate, organize and manage a technical library and information service related to the building and civil engineering industry. A knowledge of architecture and building will be of advantage and preference will be given to a University graduate. Write, stating age, experience and salary required to:

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THE TOILETRY DIVISION OF BEECHAM GROUP LIMITED

has a vacancy in the technical library of the Product Research Laboratory for a

LIBRARY ASSISTANT

The work is varied and applicants should have some general library experience, including loans, U.D.C. classifying, abstracting and searching.

Other duties can be in the preparation of bibliographies and summarising of information for internal circulation.

Every encouragement is given to gain further qualifications.

Sex: Female.

Age: 20–30 years.

Write or telephone for further information to Miss R. Grant, Personnel Officer, Beecham Toiletry Division, Beecham House, Great West Road, Brentford, Middlesex.

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Aslib Proceedings

incorporating Aslib Information

REPORT ON THE ASLIB THIRTY-EIGHTH ANNUAL CONFERENCE

The Social Organization of Information

THIRTY-EIGHTH CONFERENCE PRESIDENTIAL ADDRESS BY LORD SHACKLETON

Forty Years of Aslib

FORTIETH ANNIVERSARY APPRECIATION BY A FOUNDER MEMBER

ASLIB · 3 BELGRAVE SQUARE · LONDON SW1

Aslib Proc. vol.16 no.12 p.361-389 London, December 1964

Everything from teaspoons to typists

You ought to meet Gladys Neale. Simply because there isn't anyone else like her at Blackwell's. Or anyone else like her in the whole wide world.

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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 16 **December 1964** **Number 12**

ASLIB CALENDAR 1965

January

FRI.1. Technical Translation Group annual general meeting at Aslib, 3.30 p.m. 5 p.m., 'Interpreters at international conferences', by A. T. Pilley.

MON.4 – FRI.8. Repeat of senior introductory course to special library information work.

WED.6. Film Libraries Group meeting at Shell Centre, 6.30 for 6.45 p.m. K. Brownlow's film on Nazi occupation of Britain.

WED.13. Electronics Group winter meeting and sherry party at Aslib, 5 p.m. See paragraph below.

THUR.21. Engineering Group conference at Aslib, 10 a.m. 'Industrial market research.' See paragraph below.

TUE.26. Evening meeting at Aslib, 5 for 5.30 p.m. 'A new university prospect.' See paragraph below.

February

TUE.2. Midlands Branch meeting, Arden Hotel, Birmingham, 6.30 p.m. 'The Cranfield project', by Jack Mills.

TUE.2 – WED.3. Course on work with patents. See paragraph below.

MON.22 – TUE.23. Course on co-operation in library and information work.

THUR.25. Evening meeting at Aslib, 5 for 5.30 p.m. Paper by Timothy Raison, Editor of *New Society*.

March

WED.3. Film Libraries Group meeting at Shell Centre, 6.30 for 6.45 p.m. Sir Arthur Elton on the work of the Film Centre.

THUR.4. Technical Translation Group meeting, 3.30 p.m. Discussion, led by J. B. Sykes, on whether translator is justified in improving style of original text.

FRI.19. Scottish Branch annual general meeting and one-day conference, Edinburgh. See paragraph below.

TUE.23. Midlands Branch annual general meeting, Engineering Centre, Birmingham, 6.15 p.m. 'Practical aspects of industrial librarianship', by D. Bagley and D. Whale.

April

THUR.1 – SAT.3. Aeronautical Group and Technical Translation Group joint conference at Cranfield. See paragraph below.

WED.7. Film Libraries Group annual general meeting and film at Shell Centre, 6.30 for 6.45 p.m.

Aslib Administrative Assistant

Miss Elizabeth Petree has been appointed Administrative Assistant to the Director of Aslib, and joined the staff in November. Miss Petree was Deputy Secretary of the College of General Practitioners from 1954 to 1964. She was earlier employed at the Royal Institute of International Affairs.

A New University Prospect

At the Aslib evening meeting on Tuesday 26th January 1965, three university librarians will speak—Mr Dennis Cox (Sussex), Mr Harry Fairhurst (York) and Mr A. Graham Mackenzie (Lancaster). Mr G. Woledge (London School of Economics) will take the chair. The meeting will be held at 3 Belgrave Square (5 for 5.30 p.m.). A leaflet giving fuller details is being distributed with this issue of *Aslib Proceedings* and additional copies are available on request.

Course on Work with Patents

Patents are an important source of technical information, but owing to peculiarities mainly caused by their status as legal documents they are not used as much as they should be. In most organizations patent work is dealt with by specialists, but a good understanding of patents is of great value to information officers. Aslib is therefore once again holding its course on work with patents and elementary law, on Tuesday and Wednesday 2nd and 3rd February 1965.

The lecturer will be Mr Felix Liebesny, B.SC., A.L.A., F.I.INF.SC., Librarian, the British Aluminium Company Ltd. The course is intended for people whose work is concerned with the administration and exploitation of patents, and will not deal with detailed aspects of patent law. The fee for the course will be 6½ guineas. The programme is enclosed with this issue, and applications should be made to the Education Officer, Aslib, on the form supplied with it.

Scottish Branch

The third information course organized by the Branch was held in the Allan Water Hotel, Bridge of Allan, on 13th and 14th November. A widely representative group of members from all areas of Scotland agreed that the change to a residential course was beneficial for all concerned. The four speakers—Mr J. G. Hall, Mr Cyril W. Cleverdon, Mr A. C. Low, and Dr M. C. Pottinger—presented contributions (details of which were announced in the October *Aslib Proceedings*) which were topical, practical and interesting. Confirmation of this was apparent in the extended discussions which followed each paper. The exertions of the informal working party, which had been allocated one hour on the Friday evening for a debate on the papers, had to be brought to a close after more than two hours of active, apposite deliberation.

The Annual General Meeting and one-day conference of the Scottish Branch will be held on Friday 19th March 1965, in the Rooms of the Royal Society of Edinburgh, 22 and 24 George Street. The programme will probably begin at 10.30 a.m. and end about 4.30 p.m. The theme of the conference will be based on a comparison of the services offered to readers by different types of library. Further details may be obtained from the Branch Honorary Secretary, Mr W. H. Rutherford, Royal Society of Edinburgh, 22 and 24 George Street, Edinburgh 2.

Aeronautical Group

The Winter Meeting of the Group was held on 6th November. In the morning a visit was made to the Ministry of Aviation Technical Information and Library Services at First Avenue House, where new equipment was demonstrated. At the Royal Aeronautical Society in the afternoon Mr W. T. Gunston, until recently technical editor of *Flight International,* gave a very interesting talk on his work for that journal. This was followed by a sherry party admirably arranged by Mr F. H. Smith and his assistants.

The annual conference will be held jointly with the Technical Translation Group from 1st to 3rd April 1965. There will be two papers from the TTG, by Dr M. Goyer and Mr F. E. Wallwork. Dr Urquhart or one of his assistants will speak on the National Lending Library, with special reference to the handling of preprints, conference papers, and unpublished reports; Mr T. I. Bell, of the Royal Aircraft Establishment, Farnborough, will speak on patterns of publication, and the technical paper will be by Mr R. G. Thorne. More details will be given later, and all members of both Groups will be sent application forms when these are printed.

Chemical Group

On Wednesday 25th November twenty-five members gathered at headquarters for a sherry party. Following upon this was a brains trust at which Mrs Bourton, Mr J. Hanson, Mr J. Hall and Mr J. Rippon agreed to answer questions. A bright and breezy evening ensued, and it was with reluctance that the meeting closed at 8 o'clock. Two further events are being arranged for the early part of 1965 and all members will receive details in due course.

Electronics Group

A winter meeting will be held at Aslib Headquarters on Wednesday 13th January 1965 at 5 p.m. Mr T. M. Aitchison will speak on the results of the recent 'Survey of industrial libraries in the Group' and a discussion period will follow. This in turn will be followed by a sherry party, beginning at 6 p.m., at Aslib Headquarters, for which a charge of 7*s* 6*d* will be made. This is the first function of this type to be held by the Electronics Group and all members will be most welcome.

Notification of attendance should be sent to Mr K. J. Spencer, Ministry of Aviation Central Library, St Giles Court, St Giles High Street, London WC1, by 6th January, stating whether this is for the paper, the sherry party, or both.

Engineering Group

A one-day conference on the very topical subject of 'Industrial market research: information and techniques' has been arranged for Thursday 21st January 1965, at Aslib. An outline of the subject will be given by Mr E. A. Lever of the British Institute of Management, followed by an account of the activities of a market research department in a large firm, presented by Mr R. J. Finlayson of Hawker Siddeley. After lunch, Mr E. P. Ward of Martech Consultants will give a paper on product planning and market needs; the proceedings will close with a paper by Mr I. Ross of British Nylon Spinners Limited, on economic information services for management. The conference fee will be 30*s* inclusive of lunch. Those wishing to attend are asked to notify Mr D. P. Woodworth, British Institute of Management, 80 Fetter Lane, London EC4.

Food Group

On 3rd November a meeting was held to consider the formation of an Aslib Food Group. Thirty-three members attended and a number of proposals for activities were put forward. A Steering Committee of six members was formed to consider these proposals in more detail, with a view to making formal application to Aslib Council for recognition at its March meeting.

The Group activities so far proposed include notification of meetings and conferences in the food field, a review of UDC schedules in food, and suggestions to publishers regarding new books and reprints of out-of-print books in food technology; other schemes are under consideration. These should be of interest to all members concerned with food production, manufacture and distribution, nutrition, legislation and additives. The Chairman of the Group—Mr C. Hewetson, Information Officer, H. J. Heinz Co. Ltd, Waxlow Road, Harlesden, London NW10—would be very glad to hear from members interested in joining.

Imported Books and Periodicals: 15 per cent Surcharge

Representations were made by the Director of Aslib to the President of the Board of Trade, when the 15 per cent surcharge on imported goods was announced, to the effect that the surcharge, if levied on imported books and journals, would be detrimental to the nation's research effort and technological progress. It was subsequently announced that these categories of imports would be exempt from the surcharge.

30th Conference of FID

The annual conference of the International Federation for Documentation took place at Scheveningen, Holland, from 21st to 26th September 1964. Among the delegates from the United Kingdom were Aslib's Director, Mr Leslie Wilson, who is Treasurer of FID, and Mr J. R. Stocks and Mr R. C. Wright, both members of the Aslib Council. In all, twenty-seven countries and seven international organizations were represented. The work programme was divided between business meetings and study committee discussions; the range of the latter included linguistic problems, training of documentalists, and technical information for industry.

The General Assembly re-elected Dr Adkinson as President of FID for the term 1966 to 1968. It was announced that a final report on the FID programme and organization in the coming years will be presented to the next conference of the Federation in Washington, 10th–16th October 1965.

Of the other plans and policies discussed at Scheveningen, the following may be of special interest. During the next few years FID is to pay special attention to the documentation needs of developing countries and an *ad hoc* group was set up to advise on the form which FID's contribution might take. The information unit on abstracting services at the General Secretariat is gradually to be developed into a clearing service for information on sources of information, such as data centres, indexing services, and review journals. Finally, in the publishing programme, a report on the bibliographical coverage of documentation literature is planned for 1965.

German Institute for Documentation

The annual conference of the Deutsche Gesellschaft für Dokumentation E.V. took place at Bad Dürkheim from 5th to 7th October. About 300 people attended and the countries that were represented included Holland, Poland, Norway, Austria, Yugoslavia, Denmark, China and Israel. From the United Kingdom Mr R. Snel, of Shell International Petroleum Company Limited, gave a presentation on co-ordinate indexing. Mrs Elin Törnudd, from Copenhagen, commended the research being carried out in the United Kingdom, the United States and Denmark on the requirements and habits of users of information. Aslib was named as a good example of co-ordination of effort.

Chemistry and Chemical Technology Course

Providing there is a sufficient number of students the Sheffield College of Technology is to run a series of lectures for The Library Association Final Paper on Chemistry and Chemical Technology, beginning in January 1965. Full details may be obtained from the Tutor-Librarian or from the Librarian-in-charge at Sheffield College of Technology, Pond Street, Sheffield 1.

Course on Medical Libraries

The North-Western Polytechnic and the Medical Section of the Library Association are planning a medical libraries course to be held in London from 18th to 22nd October 1965. As well as lectures by specialists in the medical library field there will be visits to outstanding medical collections in the London area. Preliminary inquiries may be made to Miss M. Joy Lewis at the School of Librarianship, North-Western Polytechnic, Prince of Wales Road, London NW5.

UDC Special Subject Edition for Metallurgy

The Iron and Steel Institute has just published a special selection covering the whole of the UDC as far as it has been found necessary for the range of subjects encountered in metallurgical literature. In addition to the central core of metallurgy and metal working, ferrous and non-ferrous, there are sections on physics, chemistry, nuclear science, fuels, education and training, history, and other fields. There is an alphabetical index. The edition has the approval of the British Standards Institution and the International Federation for Documentation.

Universal Decimal Classification: special subject edition for metallurgy (FID no. 362, Iron and Steel Institute Special Report 84) is available from the Iron and Steel Institute, 4 Grosvenor Gardens, London SW1, price 60*s* a copy.

Sources of Business Information

A revised edition of Edwin T. Coman's American reference book *Sources of business information* was published in October by the University of California Press (distributed in the United Kingdom by Cambridge University Press, price 68*s*). There are four introductory chapters on the methodology of finding business sources and eleven chapters treating subject fields, such as statistics, automation, management, and foreign trade.

The arrangement within chapters is itself an aid to the user; first, bibliographies; then works (including some authoritative handbooks) that comprise the greatest amount of data in one volume. Yearbooks and annual summary numbers of periodicals are stressed, then trade magazines and other current publications, then books and journals that treat the topic from a broader point of view. Finally, the specialized phases of a given business activity are presented, with sources of information about them.

There is a list of basic reference books recommended for every business collection, and an index.

Who Owns Whom (UK edition) 1964

The seventh edition of *Who owns whom* is now available It contains 46,000 entries as against 39,000 in the last edition, and the coverage of private companies is wider. The price is £8 post free and there are four quarterly supplements available, price £1 post free. Orders should be placed with O. W. Roskill & Co. (Reports) Ltd, 14 Great College Street, London SW1.

Bibliography of Social Work and Administration

The eleventh supplement of this bibliography, covering 1963, has just been published. Copies may be ordered from the Joint University Council for Social and Public Administration, 218 Sussex Gardens, London W2, price 7*s*.

World List of Scientific Periodicals

The second (F–P) of the three volumes comprising the fourth edition of this work has now been published. The set is issued by Butterworths at £25 for the three volumes. Further information may be obtained from the publishers, who hope that the final volume will be produced in December.

Union Lists of Serials: a Bibliography

Recently published by the Library of Congress, this is the first attempt since that of 1943 in Gregory's *Union list of serials* towards a comprehensive inventory of union lists of serials. The bibliography cites 1,218 union lists, and the entries from fifty-six countries are geographically arranged. There are also three indexes: an index of names, a subject index, and a geographical index. Details are given in each entry of the number of serials included and the number and location of libraries whose holdings are represented in the list. Copies are available from the Superintendent of Documents, Government Printing Office, Washington, DC 20402, at $1.25 each.

Union List of Opaque Microforms

The second edition of *A union list of publications in opaque microforms* has now been published. It is compiled by Eva Maude Tilton and covers the output of twenty-six, mainly American, producers. Entries are arranged alphabetically under authors of books or titles of journals; the volume is 744 pages long and includes a subject index. It is published by the Scarecrow Press and distributed in the United Kingdom by Bailey Bros and Swinfen Ltd, price 150*s*.

Soviet Physics—Nuclear Physics

The American Institute of Physics is to publish a new monthly periodical, *Soviet Physics—Nuclear Physics,* beginning in July 1965. This will be a translation of the newly announced *Yadernaya Fizika,* published by the USSR Academy of Sciences. The annual subscription will be $70 in the United States, Canada and Mexico, and $74 elsewhere. Details may be obtained from Department S, American Institute of Physics, 335 East 45th Street, New York, New York 10017.

Collection of Cartoons and Caricatures

Dr O. Nacke, Stapenhorstrasse 62, 48 Bielefeld, Germany, is making a collection of cartoons and caricatures of librarians and documentalists. He would be glad to receive copies of cartoons or references to them; he will also send inquirers copies of items in his collection at a small fee to cover costs.

NEW MEMBERS

CORPORATE

Name	*Locality*	*Representative*
AF Cambridge Research Laboratories	U.S.A.	O. V. Groos
Aluminium Wire & Cable Company Ltd	Glamorganshire	Mrs A. H. Hare
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Cambridge University Press	Cambridgeshire	Librarian
Centre de Recherches de Pont-a-Mousson	France	M. Secretant
Chemstrand Limited	Leicestershire	C. R. N. Johnson
Crosse & Blackwell Ltd	London	P. J. Goode
Du Pont de Nemours & Co. Inc., E.I.	U.S.A.	B. E. Holm
Ghana Academy of Sciences	Ghana	J. A. Villars
Instituut voor Tropische Geneeskunde	Belgium	G. Roelants
Inter-Governmental Maritime Consultative Organisation	London	A. A. Wenpe
Metal Box Co. Ltd (Information & Statistical Department)	London	E. D. Cahill
Metal Box Co. Ltd (Technical Engineering Department)	London	J. Martin
Ministere de l'Agriculture de Canada	Canada	Librarian
National Institute for Physical Planning & Construction Research	Ireland	Miss A. McNicholl
Sarabhai Common Services (Karamchand Premchand Private Limited)	India	B. R. Deolalikar
Scott, James (Electronic Engineering) Ltd	London	L. A. Smulian
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White Fish Authority	Yorkshire	
Wickman Machine Tool Sales Ltd	Warwickshire	K. L. Pickett
Willesden Technical College	London	Miss K. M. Hancock

INDIVIDUAL

Name	*Locality*
Billington, A. H.	Surrey
Buckingham, Miss A.	Yorkshire
Dash, T. H.	Australia
Easterbrook, Miss C.	Hampshire
Howarth, D. A.	Berkshire
Jones, Mrs A. R.	Surrey
MacGregor, G. E.	Belgium
Meyer-Uhlenried, Dr K. H.	Italy
Sykes, E. W.	Middlesex
Young, Miss M.	Yorkshire

REPORT ON THE ASLIB 38th ANNUAL CONFERENCE

University of Exeter, 28th September–1st October 1964

THE pleasant surroundings at Exeter University, which is set in a very beautiful park, were a factor in the success of this year's Conference. Sessions were held in the Washington Singer Laboratories, meals served in the spacious Devonshire House Refectory, whilst residential accommodation was at the new Duryard Halls of Residence, in three 'houses' but served by a Central Dining Hall. The main disadvantage was the distance between residence and sessions, which had to be overcome by coach transport, but which was in some measure offset by the warm sunny weather.

The Chairman of Council, Mr L. G. Patrick, Librarian of Aluminium Laboratories Limited, opened the conference with the following words:

'Sir James Cook, Lord Shackleton, ladies and gentlemen, it is my privilege to open this, the 38th Annual Conference of Aslib, consisting of some 370 delegates. While not presuming on the functions of the first speaker, may I be permitted to express a brief word of sincere welcome to all on behalf of the Aslib Council and its 1964 Conference Committee. It is certainly their hope that the Conference will be found helpful in many ways.

Particularly we wish to welcome the twenty-three delegates from overseas. We are indeed happy to have with us those from at least each of the following countries, or their embassies, and including some representing international organizations: Australia, Austria, Canada, France, Germany, Israel, Netherlands, South Africa, Sweden, USA, USSR, and Yugoslavia; twelve countries in all, in addition to the United Kingdom.

We are sure that we shall profit by their attendance and hope that our visitors from overseas will let us gain from their experience in the discussions and in personal conversation. Reciprocally, we trust that they will both enjoy the Conference and take benefit from it.

Also may I add how glad we are to have with us those attending an Aslib Conference for the first time. They will quickly find that friendliness is a characteristic feature of the Conference, and any feeling of shyness may quickly be shed. Please feel free to share your experience with us in the discussions and learn for yourselves how easy it is to enter into conversation with other members of the Conference hitherto unknown.

Now it is my very pleasant duty to invite Sir James Cook to address the Conference. We are glad to have you with us or perhaps, Sir James, I should say to be with you, for at least two reasons. Firstly, as Vice-Chancellor of the University of Exeter, Sir James is our host, and secondly, as Chairman of the

DSIR Information Committee, he shows us, in a practical way, his deep personal interest in the problems of scientific and technical information with which Aslib is so greatly concerned.

In the former capacity we are grateful to him for making available to us the facilities and amenities of a beautiful university in its tranquil yet intellectually stimulating setting.

In the latter capacity we are grateful for the care and consideration which he and his Committee give to Aslib's periodical applications for Government funds.

A chemist, Sir James has doctorates from London, Dublin, Nigeria and Rennes. He is a Fellow of the Royal Society and a member of the DSIR Research Council as well as Chairman of its Information Committee. His further honours and activities are numerous. Thus, among them he is a Davy Medallist of the Royal Society, a Past President of the Royal Institute of Chemistry and an Honorary Member of both the Polish and the Chilean Chemical Societies. He was Chairman of the Committee on the Composition of Milk and is Chairman of the Advisory Committee on Poisonous Substances used in Agriculture and Food Storage.

We are also glad that we shall have the pleasure of the company of Lady Cook at some of our Conference functions.

Ladies and gentlemen, Sir James Cook.'

The Vice-Chancellor, Sir James Cook, CBE, welcomed the delegates with the observation that Exeter University was becoming known as a conference centre, and had been host to forty conferences during the summer vacation. He said that he had a special interest in the work of Aslib because he was Chairman of the DSIR Information Committee, and was particularly impressed by the importance of its work. He added that in the past we, as a nation, had tended to lag behind other countries in documentation, and he hoped that DSIR support for Aslib would continue. The principal problem, as Sir James saw it, was the enormous growth of primary publications and he illustrated this by quoting the semi-serious prediction that one journal (he thought it was *Physical Reviews*) would weigh the earth by the end of the century if it expanded at its present rate.

The Chairman thanked Sir James for his kind words of welcome and continued thus:

'At the St Andrews Conference last year it was my privilege to read a message from Lord Shackleton, President of Aslib. This year we are delighted to have our President with us in person. Before inviting him to give us his Presidential Address, may I say how proud we are to have you, sir, as our President and how grateful we are for the splendid service you are giving to Aslib.

The son of a famous explorer, Lord Shackleton, in his younger days, himself took part in the Oxford University expeditions to Sarawak and Ellesmereland. He was created a Life Peer in 1958 and has frequently led for the Opposition* in the House of Lords. His great energy has enabled him to combine this leading Parliamentary role with the virtually full-time and exacting duties of a Director of the John Lewis partnership. As President of Aslib he has spared no effort to help forward Aslib's purposes by, for example, contributions to debates in the House, enlisting the support of prominent industrialists and public figures for Aslib's interests, and gracing Aslib's occasions and making himself easily accessible to the members present. Many of the members he has met on these occasions have had reason to be struck by the breadth of his interests and depth of his knowledge over a surprisingly wide range of subjects. Those who know him more intimately realize that this springs from a genuine regard for people and a deep concern with many facets of the nation's life—coupled with the most painstaking efforts to collect, sift and assess all the available information on a subject before reaching his conclusions. Perhaps that is what makes him such an appropriate choice as President of our Association. One might almost say at this stage in Aslib's development: "Si Shackleton n'existait pas, il faudrait l'inventer."

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* Lord Shackleton is now Minister of Defence for the Royal Air Force.

Lord Shackleton, it is with pride in our President and with the greatest interest that we shall now listen to your Presidential Address.'*

In reporting the Conference special tribute should be paid to the first small *ad hoc* Committee to be entrusted by Council with planning the programme. This Committee, Mr A. H. Holloway (Chairman), Miss M. Gosset, Mr T. M. Aitchison, and Mr C. W. Cleverdon, decided on a new pattern which included an invitation to all Aslib members to submit papers on a theme—looking forward in documentation. For fifteen months the Committee worked indefatigably, with the help of a panel of expert referees (the 'back-room boys'), reading, assessing, selecting, and editing papers to form a balanced programme, which they even piloted through by sharing amongst themselves the responsibility of chairmanship of the sessions at the Conference itself. In addition, thanks must be given to Mr Cleverdon for undertaking to produce the papers in a volume of preprints, so that they could be sent to all participants four or five weeks before the Conference, at which the authors then only briefly introduced their papers before discussion. It is gratifying to note that the attendance figure for this Conference was 25 per cent larger than any previous Aslib Annual Conference, attributable at least in part, we believe, to this new method of presentation.

The following were the papers included in the preprints, listed session by session:

1. *A brief up-to-the-minute report on Aslib research work*

Mr Holloway took the chair. Only a skeleton outline was preprinted, and Mr Hanson and members of the Research Department were the speakers.

2 *and* 3. *Information storage and retrieval*

Mr Cleverdon took the chair for two sessions.

Vocabularies for Peek-a-boo (Batten card) indexing, by W. Raymond Moss, Shell Chemical Co. Ltd;

The SLIC index (Selective Listing in Combination), by John R. Sharp, British Nylon Spinners Ltd;

The statement index: a subject index constructed from the syntax of titles, by J. C. R. Yeats, Rowett Research Institute;

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* See p. 374–80 below.

A punched-card indexing scheme for organic chemistry, by R. D. Mannix and T. Whitehall, Unilever Research Laboratory, Port Sunlight;

A punched-card index to technical reports, by T. N. Shaw, Unilever Research Laboratory, Port Sunlight;

The use of computers for information retrieval, by R. C. M. Barnes, Atomic Energy Research Establishment, Harwell;

Mechanized information retrieval and library education, by C. D. Batty, College of Librarianship, Aberystwyth (formerly at Birmingham School of Librarianship);

An integrated system for processing published information using IBM 1620 computer and the IBM 870 document writing system, by H. East, formerly of Unilever Research Laboratory, Port Sunlight (now of Aslib Research Department);

The L'Unité system with multiple search facility in the form of a Texoler sorter, by Th. W. te Nuyl, Shell Internationale Research Maatschappij NV, Netherlands;

Use of IBM computer equipment for small volume information requirements, by H. J. Zwillenberg, Weapons Research Establishment, Department of Supply, South Australia.

4. *Primary and secondary publication*

Mr Aitchison took the chair.

Abstract cards in scientific journals, by G. Y. Craig,* Grant Institute of Geology, University of Edinburgh;

Information retrieval in the biological sciences, by Phyllis I. Edwards, Department of Botany, British Museum (Natural History);

International co-operation in abstracting: an experiment, by Felix Liebesny, British Aluminium Co. Ltd;

From One to Two Fifty: the economics of low cost bookshelf replenishment, by M. E. L. Morris, University Microfilms Ltd;

The growth of scientific literature, by Sir Thomas Scrivenor, Commonwealth Agricultural Bureaux.

5. *Library use and user needs*

Miss Gosset took the chair.

Characteristics of users and non-users of scientific information, by John Martyn and Margaret Slater, both of Aslib Research Department;

Some recent investigations into information use at the Atomic Energy Research Establishment, Harwell, by R. C. M. Barnes.

There were other sessions at this Conference. One which will long be remembered by all present for its outstanding quality was that by Mr Wilfred Ashworth of British Nylon Spinners Ltd, which was described in the programme as '*The rare ones*, a slide session in which the author makes a pilgrimage in search of ingenuity in libraries and returns with some curiosities wherewith to regale his hearers. It will be a paper which brings together many "diversities".' It did, and he did! It was a masterly presentation, scholarly and witty, supported by a long series of fascinating slides, prepared by the author for the occasion and gathered over a long period. It certainly deserved the ovation of applause at its close.

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* Mr Craig was unfortunately prevented from attending the Conference to introduce and discuss his paper.

There was then a successful evening of authors' sessions, when the authors put themselves at the disposal of such members as wished to discuss their papers in still further detail than had been possible at full sessions. Discussion went on for hours past the allotted span.

On the second evening of the Conference—the first evening had been purely social, following an excellent dinner attended by the Vice-Chancellor and Lady Cook, the University Librarian, Mr J. L. Lloyd, and Mrs Lloyd, and several other University guests—an extra session was held in one of the common rooms, to discuss aspects of feature card indexing. This had been suggested by Mr A. C. Firth of Rolls-Royce Ltd at the afternoon session, and arranged there and then by Mr Cleverdon. About sixty people attended. Mr Firth took the chair and introduced the session by recounting his experiences in setting up a feature card system at Rolls-Royce, using Visibell cards and the RE (Research Engineers Ltd) punch. He then suggested that the time be divided into sections to discuss informally *i*, thesaurus construction; *ii*, equipment; and *iii*, other aspects—which in fact were never reached! The meeting was in one respect a failure. It had been Mr Firth's intention to bring together those people who had just set up, or were contemplating setting up, a feature card system, so that they could have a basic discussion at a practical level. In fact the meeting was almost completely concerned with the theory of thesaurus building and tended to be less practical than had been intended.

On the last evening a meeting was arranged by Mr C. E. C. Hewetson, of the H. J. Heinz Company, to discuss co-operation amongst food librarians and the chances of reviving the Aslib Food Group. About twenty people attended and talked about the possible formation of a Group and the organization of a food literature abstracting service. Sir Thomas Scrivenor of the Commonwealth Agricultural Bureaux said that investigations into the possibility of running an abstracts service had reached an advanced stage. Everybody present agreed that further discussion would be useful and it was agreed to circularize all librarians concerned with food technology and allied subjects, with a view to holding a meeting at Aslib in October.

No account of this Conference is complete without mention of the excellent exhibition arranged in Devonshire House by the Publishers Association, with the help of the University Bookshop. It had its emphasis on newness—publishers had been invited to submit only those works which had been published in the current year, and to provide where possible advance material about those still in the press. A catalogue was issued under the title of *Books for scientists and technologists published since 1st January 1964*.* Aslib is very grateful to Mr P. Phelan of the Publishers Association for organizing this exhibition.

Thanks are also due to Mr Lloyd and his staff at the University Roborough Library for accepting many visitors to their library throughout the Conference.

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* Since the Conference copies of this catalogue have been distributed to all Aslib members and a few additional copies are still available from Aslib.

THE SOCIAL ORGANIZATION OF INFORMATION

LORD SHACKLETON

Presidential address delivered to the 38th Annual Conference, University of Exeter, on Monday 28th September 1964

I HAVE chosen for the title of this address 'The social organization of information'. By this I mean organization by and on behalf of society or the community. This is, I fear, a somewhat ambiguous title, but unfortunately we are operating in a field where many of the words are for us going to have a special significance, while popularly retaining a more general meaning; even the word 'information' has come to have a specialized meaning to us. I rather think the time has come when we need a single word to describe all these matters in which we are dealing. Otherwise we shall need a sentence, indeed a definition covering such words as 'information', 'documentation', 'storage', 'retrieval', 'dissemination', 'communication'. It is arguable we should perhaps have the definition before we have the word but this need not deter one from the game of word invention.

I do not know how Norbert Wiener, if he was really the author, came to invent the name 'cybernetics', but it is a convenient and appropriate term with an impeccable derivation from the Greek word 'guberneo' (κυβερνάω)—a most evocative derivation for the purpose. Inspired by this thought, I hastened to the Exeter University Library where, aided by their system of instant retrieval and by a Liddell and Scott Greek Lexicon, I devised the word 'exaggellectics' from the Greek 'exaggello' (ἐξαγγέλλω) meaning 'to inform'. I am not sure that the word is an entirely happy one, indeed it is certainly open to misinterpretation, but so is the title Aslib itself, and at least it is no uglier than 'ergonomics'. I think we might say that exaggellectics is a branch of epistemology but I must stop playing a game that any linguistic philosopher would scorn. However, I still urge the need for a single word to describe our study and our craft.

Much of what I have to say this afternoon will not be particularly original. There is, alas, no professorial chair at a university making a sustained study of this subject and, although much of the thinking and some research is being carried on, I cannot any more than you in a single address or indeed a series of papers discuss the whole of what will have to be, in my view, the subject of major research in the future. However, in the absence of a professor it is perhaps not a bad idea for a politician or even a businessman to attack the subject.

The broad purpose of this address is to argue the case for the next Government to establish machinery on a national footing for the provision and organization of scientific and all other research information and documentation. I will state right at the beginning that the purpose of a body operating in this way will be to define and identify, to advise, promote and co-ordinate, and to research and administer in the information field.

There are some grounds for supposing that the progress that can be made by any civilization is limited by the speed and effectiveness with which knowledge can be communicated. In Egypt hieroglyphic writing on papyrus made it possible for knowledge to be communicated to others and stored, but the process was so slow that the limit was soon reached. The remarkable flowering of Greek culture must have had some association with the Greek form of writing which made the transfer of knowledge more rapid and precise, though fortunately for contemporary classical research many accounts were kept on tablets. There was little progress from Roman times until the invention of printing and we today must make sure that the progress we are capable of achieving by the new methods of communicating, storing and retrieving knowledge is not halted through failure to develop system or organization.

Scientific knowledge is doubling itself every ten to fifteen years and so are the documents within which it is contained. We need to be a great deal more concerned about the scientific explosion and its recording if we are to hope to find the means of making use of it.

While probably few would dissent from the proposition that much of a nation's wealth lies in its accumulation of specialized knowledge, I suspect that, for many people, it would be a very long step from that position to acceptance of the fact that, for those sections of a nation's wealth to be converted into real terms, an integral part of national economic planning must consist of the development of systematic arrangements for the control and exploitation of the specialized knowledge generated by mankind. (The word 'control' is a loaded one when used in its popular sense, but I am here using it in a technical and precise sense.) They would look at you with slightly pained surprise if you suggested that the range of operations involved in this process should have both an expertise and a philosophy of its own, capable of development and refinement by the processes of research and testing and discussion, and that this process of refining and testing is a discipline that could be of real value in itself. We in Aslib have come to accept this, but now we have a very much harder task of pressing our beliefs on those who have the power to convert them into the mainstreams of national vigour.

While we have been accustomed to think and plan information activities —in so far as we do either—in terms of harnessing scientific and technical knowledge, we must be ready to acknowledge the needs of other disciplines in the near future. The country has not yet faced up to the importance of the social sciences and equally we have not yet fully come to grips with their information needs. No doubt when the Heyworth Committee reports we shall see the formation of a Social Science Council and of course this will give impetus to research in these subjects. The need for a proper national organization of information services concerned with the social sciences will then become much more apparent, and I hope that Aslib is giving urgent attention to ways of adapting to this field at least some of the lessons learned in relation to the natural sciences.

Nor can I see why we should overlook the humanities. I can see no reason why, for example, historical or linguistic studies should not be modernized and streamlined by the adoption of the most modern information techniques. Nor might I think that some of the university librarians amongst you are shocked by the suggestiot than the computer might on occasion replace the quill. After all, Canon Morton did much of his researches into the Epistles of St Paul with the aid of a computer, though this was not strictly speaking an information technique. You must of course see that the benefits of your techniques and work show themselves much more evidently and cogently in a steadily widening range of subjects. But there is more to it than this. Not only must you develop and adapt techniques of operation that should transform your own image into a combination of what is best in classical scholarship and modern technology; you must also, and so must we all, recognize that your activity is fundamental to political and economic planning. As a legislator I know from experience how very patchy is much of our real, organized knowledge in the field of economics, education and psychology—indeed, in all aspects of industrial and civil life, not to mention the law. We know, too, that new techniques are being developed that may revolutionize government—for example, by Professor Stone of the Department of Applied Economics at Cambridge who is seeking, with the aid of a computer, to feed the multitudinous economic variables into a cybernetic model. The structure of government is still pretty old-fashioned but as life gets more complex it is bound, I hope, to adjust its machinery so as to improve both departmental and legislative decision making. You may recently have heard of the overdue appointment of two scientific clerks to the House of Commons Library, undertaken on the initiative of Mr Austen Albu, one of the few MPs who understands this problem. This is at least a sign of the times.

There is, of course, already much first-class information provision—for example, in the Board of Trade, Ministry of Pensions, Ministry of Public Building and Works, and, not least, the Commissioners of Inland Revenue. Much of this has produced valuable raw material for all forms of research, including sociological research. As more and more is produced, a way has to be found of ensuring that this information is not only made available but is known to be available and, furthermore, retrievable, and this needs both machinery and properly trained people to organize it. A special problem arises from the growth of new sciences and especially of inter-disciplinary studies where even the words used carry different meanings to different specialists. The meaning of words has already created difficulties in medical engineering. Furthermore, as one specialist reaches out into other fields, he finds the information resources of his own subject inadequate and possibly wholly lacking in important respects for his new purpose and he is unable to find a new starting point. An example of this is the study of gerontology where the searcher may be concerned not only with radio-biology, psychology, and biochemistry, but even zoology and botany and he may well be unable to find (as was indeed the case in a particular instance in a well-known medical library) suitable reference information in the latter two fields. There was only one course open to the frustrated research worker and that was to join Aslib. However, the example serves to illustrate the problem, which increasingly will call for radical solutions.

It must be apparent that a much more far-reaching revolution in the work of documentation and information research is called for than the modest steps which you have been quietly and painstakingly leading during the last thirty or forty years. All this implies a radical re-thinking of our approach to information and documentation services. What has often been regarded as just a series of technical operations incidental to particular research and development must be recognized as a study in its own right. Increasing effort must go into developing a theory and philosophy. Cybernetic concepts are already available and are of some value. Much of the theory is at an early stage, but other disciplines even as far afield as ecology may provide useful analogies.

The Scientific Advisory Committee of the President of the United States in their report on *Science, government and information* have said: 'The flow of undigested information will surely engulf our science and shatter it into isolated fragments unless we change the traditional methods that we use to handle the flood'. To do this we are enjoined to study the information transfer chain and seek desirable qualities such as compatibility between one system and another. Only thus can information, like living species in an ecological system, survive and fulfil its role. We must recognize the complexity of systems, and accept that we are not confronted with just a narrow professional problem. We are dealing with a hybrid discipline. Documentation and control of information is something that can straddle all cultures and help to set Sir Charles Snow's mind at rest.

In the past Aslib has spearheaded this attack with considerable assistance from DSIR within the limitations of grant aiding but I am doubtful as to whether the Research Association scheme, admirable though it is in many ways with its linking of grant-aid with subscription income, has been particularly suitable for the financing of work which is essentially of interest not just to those few people who are aware of it, but to the nation at large.

During the past years Aslib, despite shoestring resources, has achieved a great deal and we owe much to your officers, your Director, Leslie Wilson, and his dedicated staff. Aslib has united in a common purpose and with, I understand, a really remarkable degree of loyalty, organizations from industry, education and government; and I think we have probably been freer from the frictions from which other associations have suffered. Intellectually, leadership by Aslib is acknowledged in the international field despite the fact that there are more massive resources available in other countries, especially the USA and USSR. I am reasonably sure that no other national information organization has won—whether campaigning for it or not—the membership support of six hundred organizations in countries other than its own, in addition to its home membership, as well as many more regular subscribers to its publications.

We have, however, now reached a stage when the next Government must accept full responsibility for establishing on a national footing machinery for the proper organization of information and documentation. The Government must do so not only for its own purposes but because, alone, it can harness the diverse activities and support them on an adequate scale. Support must be found for more research, particularly if we are to achieve economy and cogency in the recording of information by using various forms of mechanization. I am glad that Aslib is putting mechanization firmly at the head of its research programme. There may be a need to concentrate much more of our information resources into a relatively small number of information centres under expert staffs. But the primary need is for a national authority of some kind which must accept responsibility for identifying national information needs, for ensuring that they are filled and for helping to develop the information system according to whatever tasks the national interest demands. 'Hitherto the Government's attitude in Britain has been negative rather than constructive', according to an editorial in *Nature* (23rd May 1964). The editorial goes on to say that 'some central authority competent to take an overall national view and identify weaknesses as well as having the resources and influence to rectify such weaknesses is obviously imperative.' This is precisely what Aslib said to the Minister for Science concerning the Trend Committee Report which, in this respect, was a rather disappointing document. Certainly Trend reckoned that the Minister for Science should assume general responsibility in regard to methods of disseminating research information but that is only one aspect of the matter. While they propose that IRDA (Industrial Research and Development Authority) should have a division responsible for co-ordinating information activities within its own sphere, there is no reference to the need to encourage information studies within either the Science Research Council or the Natural Resources Research Council. Nor must we overlook the enormous interest of both private and public industry in obtaining this information.

Now that responsibility for science and education is concentrated in one Ministry and under one Minister, and this includes universities and public libraries, it is logical for this Ministry to accept responsibility for establishing an authoritative body with undivided responsibility for development in the information field. So far, with our limited resources, we have not done too badly, but we are beginning to lag behind. The United States has established the Office of Science Information Service of the National Science Foundation in Washington and in Moscow there is the All-Union Institute of Scientific and Technical Information. In this country I hope we shall develop a system that is both more subtle and more far-reaching and that it will embrace all the 'cultures'.

Aslib has always preached the oneness of information and has rightly seen it as an incipient discipline with philosophies, techniques and aspirations of its own. While I believe that a centralized approach is essential to the solution of these problems, any national body that is set up must recognize that there is immense diversity in this field. There will need to be links with libraries of all kinds, public and private. In particular, the needs of users both corporate and individual must be known and this means more research. The professional in this field will need not only training but education on a broad inter-disciplinary basis—a requirement indeed for any good librarian. While he may often be required to be a technologist too, he must be ready to draw on the older wisdoms. To achieve all this, the authoritative body to be set up must have adequate resources and must be able to initiate or itself carry out research.

Granted that the principle is accepted—and there are signs that these needs are coming to be recognized—it is important to establish the right organization. We must approach this great issue of communication and information in a questioning mind. We do not want just a short bout of crystal gazing by a few wise men, which has so often been the basis of government decision. But of one thing I am certain, and this is the central theme of my address: if this service is to be the unifying force that I hope it will be in regard to knowledge and research of all kinds, it cannot be tied to science and technology alone. It must be made crystal clear that this body would not seek to exercise control over the subject of study though it will, I hope, influence the individuals concerned, especially some of the professors, to accept a greater degree of responsibility for 'exaggellectics' or information used in their studies, for no one is better equipped as a rule than the professor to do this and to guide and assist the professional librarian.

My own view is that something is needed of the nature of an independent Research Council. The Government cannot directly run everything, nor would we want it to. The example of the Nature Conservancy which with limited resources has achieved an authoritative position is before us. It has spread much of its thinking and influence far beyond its main conservation role, especially in establishing ecological concepts. A Research Council would fit in well with the post-Trend situation. It could have flexibility of staffing and occupation and some measure of freedom and independence in its day-to-day activities, while at the same time retaining essential links with the Government. There may be other ways of tackling the problem but I hope that we shall no longer dodge the issue. I will not attempt to spell out how the organization will work. Certainly much consideration will have to be given to abstracting services and to documentation on an international basis. Some measure of co-ordination is necessary in relation to existing national scientific libraries such as the National Lending Library for Science and Technology at Boston Spa and the new National Reference Library of Science and Invention. The present relationship is a reflection of the piecemeal 'ad hoccery' of Government decision. The membership, I would beg, should not be wholly scientific and technological. Let us by all means have people who cross the cultural frontiers whether it be the mathematician, the social scientist, the philosopher or even simply the historian. Amongst the scientists, I would have particular reasons for advocating the membership of zoologists. The Research Council will of course need a pluralistic approach, and will certainly need to maintain links with the users, for the body will exist for them.

Where would Aslib fit in? This is difficult to say, but it is certainly too early to consider assimilating Aslib completely into the organization. Aslib will need the financial strength to carry on and to continue to bridge the gap in its traditional semi-voluntary way. Aslib has successfully brought together information interests in all fields—government, private and public industry, universities, colleges, learned societies, publishers and the rest. Nor must we be afraid of some overlap though this need not mean that there is excessive duplication of effort—merely variety in approach and particularly in new ideas. It would be quite wrong in my view to contemplate, certainly at this stage, a monolithic structure.

We are dealing today with one of those elusive subjects, the full extent of whose import is apt to be missed. In any project or activity, communication, liaison, information—all these are things which people tend to deal with as an afterthought. This can no longer continue. The time has come when we must ensure that Aslib's accumulated knowledge and experience together with that gained by other bodies with a like interest, even a peripheral one, is used for the benefit of all. Sooner or later we shall need something of the standing of an independent research council and it may be that what is needed in the long run is what is needed in the short run. Its functions should be to define and identify needs and problems, to advise, promote and to co-ordinate, to carry out research and to administer directly, where this is appropriate, national institutions such as the National Lending Library for Science and Technology and perhaps even the National Reference Library of Science and Invention.

Perhaps some will think that what I am proposing is premature and that other solutions can be found. Perhaps in the next thousand years, perhaps in the next million, we shall all become cybernetic men with instant recall and telepathic aids to communication. Yet now with our limited, inadequately used brains we must seek to organize the full utilization of the product of those brains. This is a field in which, in every way, it would be fatal to be guilty of under-investment, yet we squander nothing so prodigally as knowledge. Money, metals, farm produce—waste these and the balance sheet, the scrap yard and the muck heap stand as monuments to folly. But treat knowledge as a luxury, a frill to gracious living, the product of an intellectual exercise to be tossed back and forth between experts and finally allowed to drop into the tranquil pool of things that do not count because they cannot be measured—and you can live for years with never an eyebrow raised. Or can you? Well, perhaps you could. But you will not do so again.

FORTY YEARS OF ASLIB

An Appreciation

BY A FOUNDER MEMBER

*To mark the occasion of the Aslib Fortieth Anniversary Celebration in the King's Library of the British Museum on Tuesday 10th November 1964**

THIS anniversary gives us an opportunity to look back to the origin of Aslib, and those who took part in its first meeting will no doubt feel proud of the position it has attained.†

It is important to remember that we started as an Association of Special Libraries and Information Bureaux, impressing the library world that our members were mainly users of libraries and were intent on claiming improved services from the local and national libraries upon which we depended for worth-while information on the manifold subjects in which, as individuals, we were interested. Another fact worth remembering is that very few business concerns at that time had any organized departments reviewing and collecting up-to-date publications on their field of interest.

The first week-end Conference held at Hoddesdon, Hertfordshire, in September 1924 was attended by eighty-four individuals, a modest gathering compared with the present membership of Aslib, which numbers 2,730. However, some idea of the activity of this first Conference may be gained from its time-table, which started on the Friday evening with a session lasting until 10.30 p.m. and continued with short intermissions for sleep and meals until after breakfast on the Monday. Those who were present well remembered the animated interest awakened by the meetings and the insistent demands half-way through for a repetition of the Conference. (The Second Annual Conference was afterwards planned, and held in September 1925.) The efficiency of Mr A. F. Ridley, who acted as Hon. Organizing Secretary, and the lively and untiring efforts of all taking part led Col. J. M. Mitchell, Secretary of the Carnegie United Kingdom Trust, to pay the Conference the following compliment: 'It completes a piece of administrative work which is a good deal more businesslike than that of any other Conference which I have attended'. The Carnegie Trustees' subsequent support of Aslib in its early days was really responsible for the continuation of its life.

The Trust also backed the preparation and publication of the *Aslib directory: a guide to sources of specialized information in Great Britain and Ireland,* which listed for the first time the resources of a large number of special libraries in this country, and their collections.

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* Amongst the two hundred members who accepted the invitation to attend were two Founder Members. Speeches were made by Sir Frank Francis, Lord Shackleton and Professor R. S. Hutton.

† A full account of the origin and early history of Aslib can be found in the *Journal of Documentation,* vol. 1, no. 1, June 1945, p. 6–20.

Although its growth was slow and limited by restricted finances, the work of the Association was of great national importance. This was at last recognized, after twenty years, by the Department of Scientific and Industrial Research, which gave it a status similar to that of its Research Associations in so far as it provided Government financial support linked with the subscriptions paid by members.

One of the characteristics of Aslib is the way in which it has encouraged and operated many border-line activities to help collect and distribute information. Amongst these, the Panel of Translators, the wartime microfilm copying of publications from enemy countries, jointly with the American and British Governments, and the educational courses for special librarians and information officers might be mentioned.

The Reports of the early Conferences, many of which were held in Oxford and Cambridge colleges, are evidence of the wide range of members' interests, and illustrate the way in which members have steadily developed more professional attitudes towards their problems. Today the recent research investigations which have been carried out are playing an important part both by collecting accounts of work connected with information services and by stimulating members to adopt improved methods of reviewing both current and past published information.

Those who have watched the work of Aslib realize how valuable the contributions of members of its Council and numerous committees have been. They have also been greatly assisted by the good fortune the Association has had in securing the help of an exceptionally gifted staff, amongst whom Miss E. M. R. Ditmas and Mr Leslie Wilson deserve special mention. It should be added that in 1958 a great step forward was made with the move to the building in Belgrave Square, which seemed to raise the whole status of Aslib by providing good offices and library accommodation and conference rooms.

In concluding, I would say that the opportunity of holding this fortieth anniversary meeting in the King's Library of the British Museum has impressed on members the high position that the Association has attained. It is not the first contact we have had with the British Museum Library. It was one of its retiring Keepers of Printed Books, Mr G. F. Barwick, who acted as editor of the first Aslib *Directory*; and now in most recent times we have come into close contact with the work of the British Museum Trustees in connection with the new National Reference Library of Science and Invention, for Aslib took part in the official visit to the USSR to study their extensive scientific libraries and information services. This was followed by an independent visit to the United States by the National Reference Library's Librarian, Miss M. F. Webb, to study examples of similar library activities in that country.

Letter to the Editor

TITLES OF SCIENTIFIC PAPERS

Dear Madam,

While scanning the literature for the Centre's Current Awareness Services we recently noticed two papers published at about the same time in different journals under exactly the same titles.[1] Some time ago, a similar duplication was noticed.[2]

Does anyone know how frequently such duplications occur and whether they in fact represent duplication of research and publication?

Yours faithfully,
P. S. DAVISON

Scientific Documentation Centre Ltd,
Halbeath House,
Dunfermline,
Fife.
10th November 1964

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[1] Theory of a Ferromagnetic Heat Engine. (1) F. Brailsford, *Proc. Inst. Electrical Engineers,* 111, 9, p. 1602–6 (1964).
(2) F. Brailsford, *Electronics and Power,* 10, 9, p. 314–15 (1964).

[2] Subclavian Steel (1) D. J. Price, *General Practitioner,* 28, 1, p. 112–17 (1963).
(2) C. L. Williams, S. M. Scott, T. Takaro, *Circulation,* 28, 1, p. 14–19 (1963).

NATIONAL CENTRAL LIBRARY

THE 48th Annual Report of the Executive Committee of the National Central Library, for the year ending 31st March 1964, records that completion of the new building is not likely to be before May 1965.

Applications received totalled 107,742 as against 98,690 in 1962–3. Of the 100,271 applications proceeded with, 78,962 (78.75 per cent) were satisfied; in the previous year 70,975 (76.77 per cent) were satisfied. British libraries made 3,739 loans (83.75 per cent of the requests) to libraries overseas and borrowed 3,400 items (78.35 per cent of the requests) from overseas. West Germany was both the chief lender to British libraries and their principal borrower. Loans were made to sixty-six countries and items borrowed from forty countries. The 375 outlier libraries lent 19,112 items and 6,113 applications were satisfied by other special libraries.

The Library has been reorganized. The Acquisitions Division consists of two Departments (A. Gifts, Exchanges and Catalogues; B. Book Purchase, Stock Supervision and Adult Class Work). The Interlending Division includes the Reference Department, the Clerical Department and a small Bibliographical Research Section. Loans of periodicals, BUCOP, and the Slavonic Union Catalogue are all the responsibility of a separate Department not included in either of the two main Divisions.

Work proceeded in preparation for the publication of BUCOP on a quarterly basis with annual and quinquennial cumulations, as from March 1964. Agreement was reached with the Council of the World List of Scientific Periodicals that this publication should in future be merged with BUCOP. Each annual cumulation of BUCOP will be published in two parts: *i,* a general volume containing all periodicals listed in the previous four quarterly parts and *ii,* a volume containing periodicals in the field of science and technology as successor to the World List.

The Treasury Grant-in-Aid to the Library was increased for the year 1963–4 from £82,500 to £95,000. Subscriptions from libraries amount to just over £8,200.

The Trustees submitted to the Minister of Education their views on the Report of the Working Party (B) on Inter-Library Co-operation in England and Wales, their main point being that the proposal to reduce the Government grant to the Library to 50 per cent of its cost ignored its national character and that it should receive full State support. The Public Libraries and Museums Bill (now an Act) does not specify the proportion of the State grant to the Library as related to its total income.

A survey of loan requests for the period January to June 1964 was begun, aided by grant from the Ministry of Education and the University Grants Committee.

SELECTIONS FROM THE RECENT LITERATURE

ALL ITEMS listed may be borrowed from the Aslib Library, except those marked *, which may be consulted in the Library.

Books and Pamphlets

*ASLIB. ELECTRONICS GROUP
Handlist of basic reference materials for librarians and information officers in electrical and electronic engineering, compiled by Ellen M. Codlin. [Rev. ed.] London, the Group, 1964. [iv], 48 p. 12*s*; 6*s* members.

*ASLIB. RESEARCH DEPARTMENT
Technical libraries: users and their demands: a classification of user groups and user demands in technical libraries, by Margaret Slater. London, Aslib, 1964. [vi], 126 p. 26*s*; 19*s* 6*d* members.

*COMAN, EDWIN I.
Sources of business information. [2nd] rev. ed. Berkeley, Los Angeles, University of California Press, 1964. xii, 330 p. $8.50; 68*s*.

DATA processing yearbook 1963–64
Detroit, American Data Processing, Inc., 1964. 306 p. diagrs. $15.

*ELSEVIER's lexicon of archive terminology, French, English, German, Spanish, Italian, Dutch, compiled and arranged on a systematic basis by a committee of the International Council on Archives. Amsterdam, London [etc.], Elsevier Publishing Company, 1964. [viii], 83 p. (Elsevier lexica.) 25*s*.

EVANS, EVELYN J. A.
A tropical library service: the story of Ghana's libraries. London, André Deutsch, 1964. xvii, 174 p. illus. tables. (Grafton book.) 30*s*.

*FEDERAL ELECTRICAL CORPORATION
A programmed instruction to PERT. New York, London [etc.], John Wiley & Sons, [1963]. x, 145 p. diagrs. 30*s*.

*FEDERATION INTERNATIONALE DE DOCUMENTATION
Abridged UDC schedule for classifying literature on standardization (with an alphabetical index), edited . . . by Dr N. A. J. Voorhoeve. Eindhoven, Dr N. A. J. Voorhoeve; [The Hague, the Federation], 1963. 37 p. (FID publication no. 344.) mimeog.

FEDERATION INTERNATIONALE DE DOCUMENTATION
Bibliographie de la documentation et de la bibliothéconomie, année 1963. The Hague, the Federation, 1964. 58 p. (FID publication no. 355.) 10*gu*.

FEDERATION INTERNATIONALE DE DOCUMENTATION
Manuel practique de reproduction, documentation et de sélection. Paris, Gauthier-Villars, 1964. [x], 341 p. illus. (FID publication no. 353). 46*NF*.

FEDERATION OF BRITISH INDUSTRIES
Foreign language needs of industry: report of a working party [Final report]. London, the Federation, 1964. iv, 80 p. 10*s*.

HAWKEN, WILLIAM R.
Photocopying from bound volumes. Supplement no. 3. Chicago, American Library Association, Library Technology Project, 1964. [40] p. illus., tables. (LTP publication no. 4, suppl. 3.) $5.

INSTITUTE OF MUNICIPAL TREASURERS AND ACCOUNTANTS, *and* SOCIETY OF COUNTY TREASURERS
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